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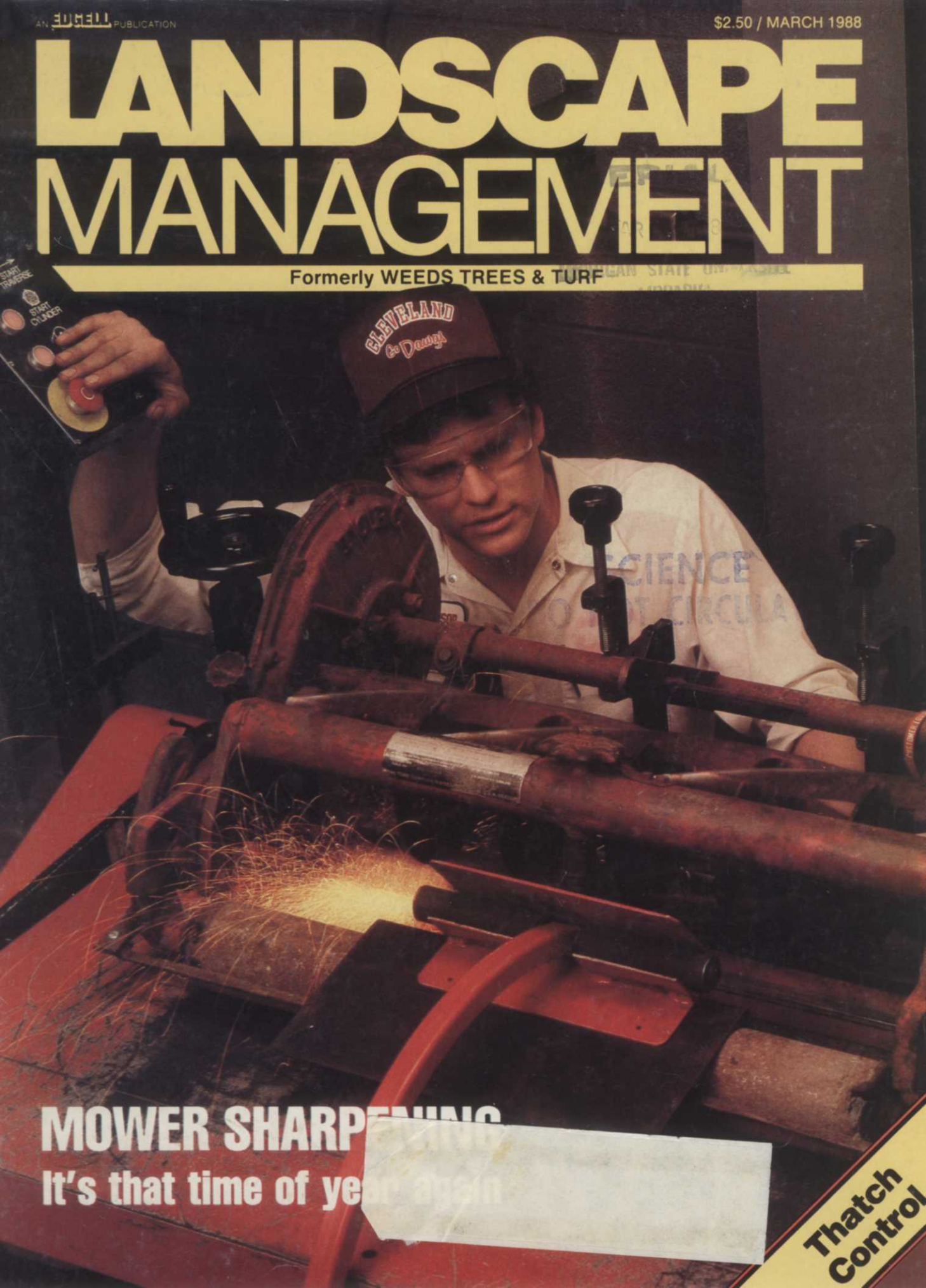

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DJ Pakkala

PennLinks PVP 8700030

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The Daily Sun
GREENSBORO, WEDNESDAY, NOVEMBER 1, 1987
EXTRA!
VOL. CXXXVI
NEW INSECTICIDE STOPS GR
IN 3 DAYS!
"Lawn care experts get 90% control in 3 days!"
by THOMAS BAGOT
Recent label approval by the Environmental Protection Agency marks the introduction of the ultimate product for grub control in home lawns.
New Triumph offers lawn care professionals many advantages in grub control.
☐ Because it's fast acting it controls grubs in 2 to 3 days.
☐ Triumph's superior chemistry provides/delivers over 90 percent grub control quickly and maintains that performance over 10 weeks.
☐ New Triumph also controls surface insects and mole crickets and is labeled exclusively for use by lawn care professionals.
☐ And new Triumph's liquid formulation and low rates mean
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One application of Triumph per year in the fall is all you need to control grubs consistently and effectively. Years of testing shows that Triumph continues to control grubs for over two months. This should prevent retreatment until the following season.
Triumph goes to work faster than other products you've used. Within two days of application, you see Triumph control grubs and other insects. That means you stop grub damage quickly, reducing complaints and keeping your

INTE
THE BEST NEWS TO

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by DAVID WOLFE
Over 10 years of testing has proven Triumph's superior control of grubs.
In research data collected from universities, independent research firms, and CIBA-GEIGY research facilities between 1974 and 1986, results showed Triumph's high levels of performance over a 10-week period.
Not only is Triumph's performance superior, it controls grubs faster than any other insecticide.
Triumph kills grubs in just

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ODUCING TRIUMPH. HIT LAWNS IN YEARS.

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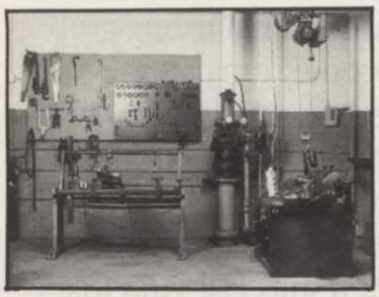
MARCH 1988, VOLUME 27, NUMBER 3

LANDSCAPE MANAGEMENT

Formerly WEEDS TREES & TURF



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24 THE GREAT COVER-UP
When the Pope visited San Francisco last fall, he appeared on a day between two baseball games. The athletic field managers at Candlestick Park used a special fabric to save the turf.

30 TURFGRASS WATER USE
Only one percent of the water applied to turfgrass is used for growth. Scientists are studying 'water use rate' of some turfgrass species for improved water savings.

34 COVER STORY: THE REEL ANSWER TO SPIN-GRINDING
Herein lies the evolution of reel mower blade grinding and sharpening. By looking back, golf course superintendents can decide which current method is best for them.

42 HERE TODAY . . . HERE TOMORROW
A perennial garden will bring color to the landscape year after year without the headaches of re-planting.

50 DEADLINE TAX PLANNING
April 15th. The date that strikes fear into the hearts of landscape contractors everywhere. As it fast approaches, you might want to run down this list of hints that can help reduce the amount of money Uncle Sam picks from your pocket.

58 THATCH MANAGEMENT
A deep build-up of thatch above the soil surface can mean trouble to turfgrass managers. One of the nation's foremost experts tells readers how to get rid of it.

64 CORPORATE STRUCTURE
The benefits of C corporations and S corporations are listed by business advisors Rudd McGary and Ed Wandtke.

68 ATHLETIC FIELD DRAINAGE
During the last decade, the Sports Turf Research Institute in England studied what makes a good field.

76 A DIFFERENT ACCENT
Use of ornamental grasses is spreading at a healthy rate across the U.S. Perhaps because they are close to being the 'perfect ornamental.'

84 SULFUR IN TURF MANAGEMENT
Use of sulfur is increasing, and not just on golf courses. Dr. Nick Christians examines this valuable fertilizer.

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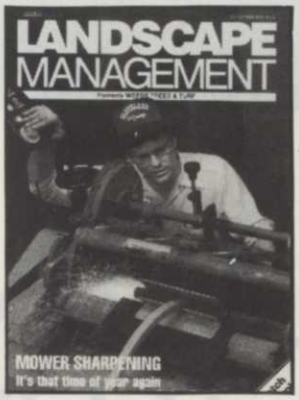

On the cover: Steve Green of North Coast Distributing in Cleveland, Ohio sharpens a reel.

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J-7-8

Circle No. 136 on Reader Inquiry Card

by the Editorial Staff

Horticulture enrollments stabilizing?

■ The December, 1987, issue of LANDSCAPE MANAGEMENT reported that, though enrollment in horticulture and agronomy is generally down, some schools have been showing plateaus or slight increases. News from the University of Maryland backs this up.

Undergraduate enrollment in specialized horticulture remained steady despite decreases in other ag disciplines at Maryland, says the horticulture department's annual report.

Bruno Quebedeaux, Ph.D., credits a landscape design option for its strength. Since 1984, enrollment has risen from 87 to 89. The reason, Quebedeaux says, is a growing landscape industry in Maryland, where urbanization is supporting both public and private construction—especially in Baltimore and Washington, D.C.

Manufacturer expects equipment sales to dip

■ Officials at JI Case, manufacturer and marketer of light- and medium-sized equipment, are predicting a flat year for equipment sales in 1988.

According to John Gleason, senior vice president for North American sales and marketing, domestic economic conditions, heavy foreign competition and stock market uncertainties could cause a modest decline in sales this year.

He adds that the decline won't come close to matching the recession of 1980 to 1982, from which equipment manufacturers took the last five years to recover.

Green industry is one of promise

■ "The challenge which the turf industry is facing is as important as that of the agriculture industry."

With those words, Virginia Commissioner of Agriculture S. Mason Carbaugh kicked off this year's Virginia Turfgrass Conference on a positive, but guarded, note. "The green industry will continue to flourish, but you must learn how to use your knowledge to best inform the public. You know the questions that have to be asked.

"It is your challenge to let the uninformed and ignorant know that the green industry can be safe to the environment *and* do its job on turf," Carbaugh continued. "There's only one environment, and we must learn how to coexist in it."

Carbaugh concluded his keynote speech in an upbeat fashion: "At a time in our history when our ingenuity has helped create different substitutions in business and industry, there is still no substitute for the green industry. It is an industry of promise. It is an industry of alert, honest, risk-takers."

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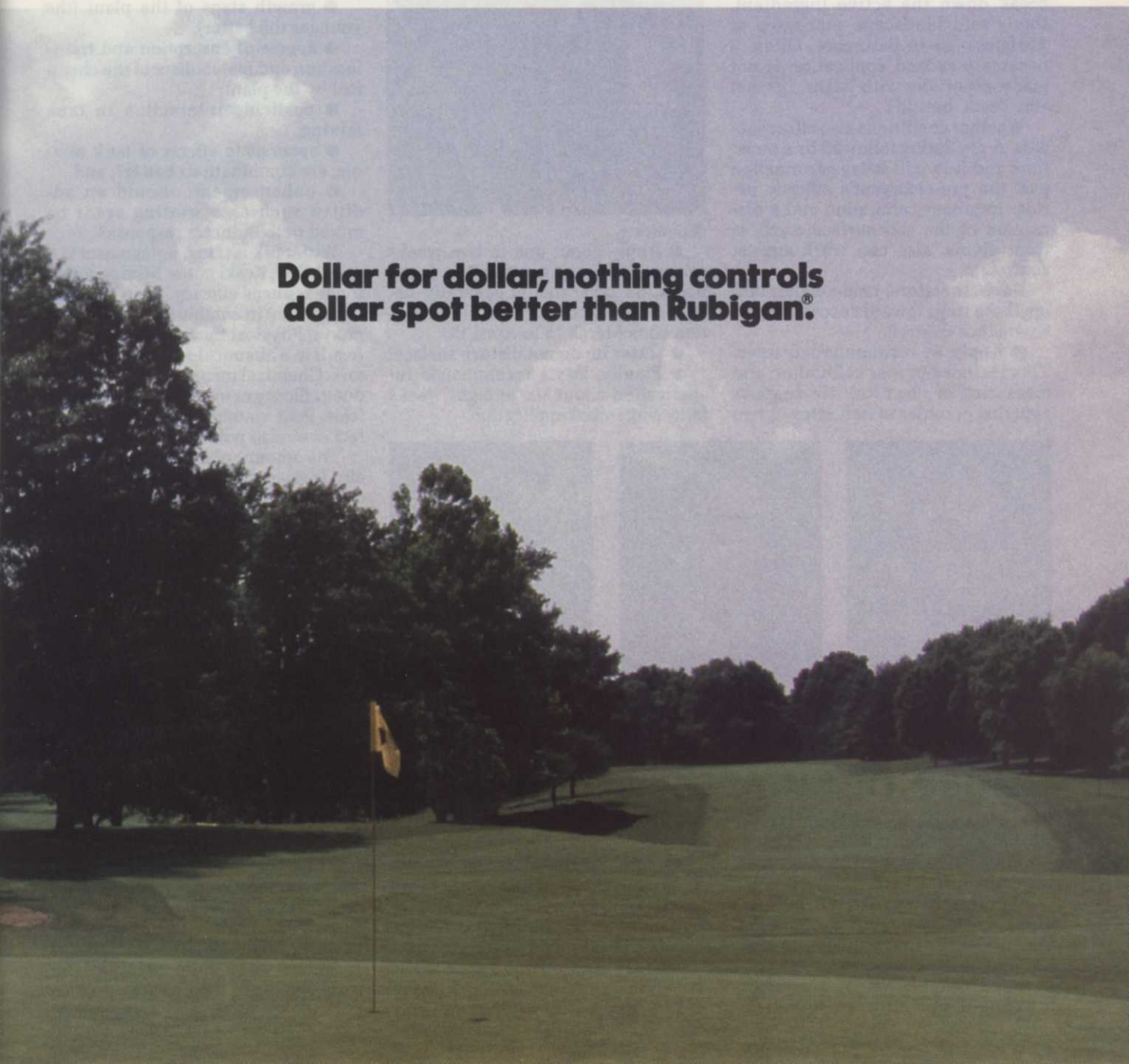
Dollar spotless.



Dollar for dollar, nothing controls dollar spot better than Rubigan®.

PESTICIDES

Herbicide failure? It's probably *your* fault

PRE-EMERGENTS

The most common reason why pre-emergence herbicides for grassy weeds fail is that they are applied too late in the growing season. Doug Davis, a research assistant at the University of Maryland, notes that few, if any, pre-emergence herbicides will knock out weeds after their germination. Also, not watering in chemicals within 72 hours of application can keep the herbicide from the germinating seed.

Light and microbial action also will break down the active ingredient, Davis told landscape managers at Turfgrass '88 in Baltimore. Often, a necessary second application is not made, especially with Balan, Dacthal and Team, he adds.

Weather conditions also affect success. A dry spring followed by a moist June and July will delay germination past the pre-emergent's efficacy period. Improper calibration and a disruption of the soil surface, such as from divots, also can work against control.

Davis, therefore, recommends taking these steps toward successful pre-emergence control:

- Apply at recommended rates. This includes proper calibration and measuring of chemical. He suggests applying granular at half rates in two directions.
- Apply about one to two weeks prior to weed seed germination. In the north, he says, this is generally between May 1 and May 20; in the transition zone March 15 to April 15.
- Water in; do not disturb surface.
- Finally, Davis recommends reapplication about six to eight weeks following initial application.

POST-EMERGENTS

Any number of outside influences can decrease the effectiveness of post-emergence broadleaf herbicides, says Tony Koski, Ph.D. at Ohio State.

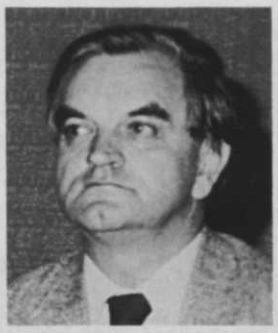
First, is the weed susceptible or tolerant to the herbicide? Key influences on this, Koski says, are:

- herbicide placement;
- herbicide dosage or proper application rate;
- herbicide formulation (either granular or liquid);
- growth stage of the plant (the younger the better);
- degree of absorption and translocation and metabolism of the chemical by the plant;
- pesticide interaction in tank mixing;
- synergistic effects of tank mixing; are combinations better?; and
- enhancement: should an additive such as a wetting agent be mixed in to induce a response?

With tank mixing, antagonism is a possibility, Koski notes. Mixing sometimes reduces efficacy, as in the case of Acclaim! in combination with phenoxys. Physical incompatibilities can result in a chemical settling out of the mix. Chemical incompatibility can reduce efficacy or even form new chemicals. Poor water quality will also affect chemical potential.

The amount of herbicide absorbed also is related to the weather. Hot dry conditions thicken cuticles and close stomata, openings through which herbicides are absorbed. Often, irrigating turf can help if weeds are growing actively. In general, Koski says, moist conditions of spring and fall are best for application timing. Rain and runoff, however, will decrease efficacy.

Koski made these observations at the Ohio Turfgrass Conference.



Jackson

Smiley

Couch

DISEASES

Cause of summer patch finally identified

Researchers at Rhode Island University have identified the causal agent of summer patch disease in Kentucky bluegrass turf.

Previously identified as *Phialophora graminicola* by Richard Smiley, Ph.D., the pathogen is now known to be a species of *Magnaporthe. P. graminicola* is a common inhabitant of Kentucky bluegrass roots, but it is not an aggressive pathogen.

Research on this topic was headed by Noel Jackson, Ph.D., and Peter Landschoot. Smiley, now working at the Columbia Basin Agricultural Research Center in Pendleton, Ore., agrees with Jackson and Landschoot. "It's a remarkable piece of work," says Smiley. "It's a further clarification. I had identified the existence of a fungus."

This is the latest in a series of theories expounded in the last 20 years on the causes of a group of turf diseases known as fusarium blight (or fusarium blight syndrome). Turf pathologists have long debated the causal agents of the diseases. The de

continued on page 18

TURFGRASS

Visualizing yourself as a turfgrass root

To get the proper perspective on dealing with the below-ground influences on turfgrass plants, Bob Carrow, Ph.D. at the University of Georgia, says you have to "visualize yourself as a root."

Getting "down and dirty" about roots, Carrow outlined their functions at Turfgrass '88 in Baltimore: to anchor the plant, absorb and translocate nutrients and water, synthesize and transport certain growth-regulating hormones, and help store carbohydrates.

To further understand roots, he advised familiarization with characteristics such as growth cycle, rate of extension, depth and density and genetic limitations: "We have to work within the genetic potential of the plants."

Root strength can be limited by physical and chemical properties of the soil, he noted. Compaction, oxygen level, water content and soil temperature limit roots physically. Chemically, pH, nutrient levels and balances and salt levels all affect root potential. Influences from other organisms also play a part.

So what does the turfgrass manager do to improve rooting? For starters, Carrow suggests selecting species and cultivars with genetically better rooting systems, information which USGA Green Section can provide.

Secondly, promote maximum net carbohydrate production with greater leaf area from higher cutting heights, provide sufficient nutrition and light and avoid consistent drought stress.

Also, avoid depleting carbohydrate reserves from excessive nitrogen feeding, over-watering and close mowing.

Physical and chemical soil conditions not conducive to strong root growth should be corrected, along with poor biological soil conditions such as the presence of diseases, insects and excessive thatch.

EQUIPMENT

Utility tractors great for landscape chores

Because of its versatility, the compact utility tractor is becoming more important to the landscape/golf course market.

"If mowing is the only thing this guy does, I'll sell him a mower," says Martin LaRue of Brooklyn Tractor and Mower, Cleveland, Ohio. "But if he's going to do more than mowing, I sell him a utility tractor. They're virtually the same price."

The compact utility tractor falls between riding lawn mowers and large (20 to 80 hp) tractors, making it useful for large mowing jobs and/or small landscaping chores.

Most compact utility tractors are made overseas. They come with a variety of accessories ranging from post-hole diggers to loaders, backhoes, plows and mower decks.

Landscapers use them for a variety of tasks while golf course superintendents usually pull reel mowers in gangs behind them.

Probably the most important factor in selecting a compact utility tractor is the amount of power in the power take-off (PTO). Fifteen to 20 hp is usually enough for light landscaping jobs, but golf course superintendents who have larger (seven gangs or more) mowers need at least 30 hp, according to LaRue. And for production mowing, a machine with cruise control eventually pays financial dividends.

Utility tractors like this one can double as grass mowers.

Ground speed should be one of the least important factors in selecting a compact utility tractor. Most compact tractors don't top 12 mph for safety reasons.

Get in 18 holes in the time it took you to do 9.

If your greens aerator is taking its time instead of making time, Toro has great news for you.

Now you can aerate your greens faster than ever before. Powered by a 16 hp engine—twice the horsepower of the leading competitor—Toro's new Greens Aerator can aerate up to 13,000 square feet per hour. That's almost double the territory the other machine can cover!

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Toro outdistances the competition with a faster coring ground speed and a greater coring width. But that's only the beginning. Toro is also way out in front with these performance and durability features:

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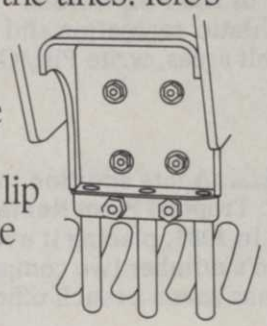
Better penetration.

Heavy-duty construction gives you a deep, 3″ coring depth and more uniform penetration of the tines. Toro's design also assures clean removal of the core without damaging the lip of the core hole or the playing surface.



Easy operation.

Electric starting gets you moving fast. Large floatation tires glide easily over the turf and make the aerator easier to control. And a reverse gear—another Toro exclusive—gives you added maneuverability.

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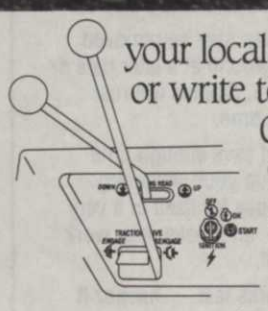
Tines can be changed in less than five minutes with an ordinary socket wrench. And with Toro's unique modular design, you can remove the coring head within minutes.

If you'd like to speed up your game, take a look at the revolutionary new Toro Greens Aerator. Just contact your local Toro distributor or write to: The Toro Company, Commercial Marketing/AA, 8111 Lyndale Avenue South, Minneapolis, MN 55420.



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SHORT CUTS

DIAGNOSING FAILURES... Research assistant Doug Davis of the University of Maryland suggests some reasons why the new post-emergence grassy-weed herbicide Acclaim! might not have been so effective in 1987. It's not the product—it's application timing and technique, Davis surmises. Acclaim! may not be wholly effective if: it is applied under dry soil conditions; it is applied with a flood jet nozzle; it is applied with a backpack sprayer; it is applied with a broadleaf herbicide in tank mix or within five days of broadleaf application; grass is mowed within 24 hours of application; it rains before Acclaim! has a chance to dry on leaves; or it is applied at a rate too low for weed size or with improperly calibrated equipment.

TOP 50 REVISITED... In "The Best of the Rest" list appearing in the February issue of LANDSCAPE MANAGEMENT, R.B. Stout, Inc. of Akron, Ohio was inadvertantly left off. The company's sales of $3.2 million in 1987 fell just short of the Top 50.

FOOD FOR THOUGHT... That's what Jack Henry of Kidwell Turf Farms offered the Virginia Turfgrass Association after 24 years as a golf course superintendent. Said Henry: "Longevity at a single club may be overrated. Move when you're young; don't move when the kids are in school; move again when they've graduated." Other Henry observations: "Plan your vacation time, then take it. You might as well accept the fact that you'll never get everything done;" "The bigger the job, the bigger the problems. Be careful when you add responsibility (new holes);" "Avoid zealots, fanatics and self-promoters;" and "Try to make it fun. No one else takes us seriously, so why should we?"

SHADES OF THE SUPER BOWL... Just one week before the 1988 Super Bowl was to be played, Washington Redskins general manager Bobby Mitchell, asked quarterback Doug Williams if he would like to meet some people at the Virginia Turfgrass Conference. Williams said he would be too busy—until Mitchell told him the turf professionals wanted to hear his views on natural vs. artificial turf. "Where do I have to be, and when?" Williams quickly piped up. He had only good things to say about playing on natural turf during the meeting in Richmond.

FREEBIE... For a free copy of the PBI/Gordon "Vegetation Management Program" for athletic, recreation and park areas; boulevards and other greenbelt areas, write PBI/Gordon, Box 4070, Kansas City, MO, 64101.

TOP 50 REVISITED AGAIN.....A late addition to the Top 50 landscape contractors of 1987: Tropical Plant Rentals, based in Chicago, grossed $35 million in 1987, placing it even with the Brickman Group as the nation's number two company by volume of sales. The company has seven branch offices and 700 workers.

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Nourishing your turf with NITROFORM® assures better root development and healthier turf by providing six important benefits.

1 Consistent 38% nitrogen.

2 Sustained, predictable release by soil bacteria to provide nitrogen when needed most by roots and vegetative parts.

3 Provides organic nitrogen and carbon to enhance bacterial activity, even in sandy soils.

4 Non-burning to turf, trees, or ornamentals when used as directed.

5 Environmentally sound... resists leaching, even in porous soils.

6 Fewer applications a year are required.

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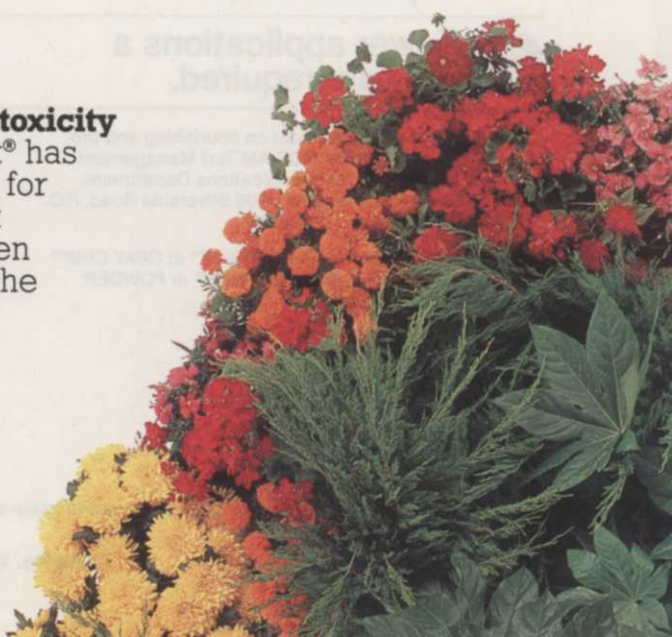

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bate is significant because both the identity and the cause of a disease are crucial to its control.

"This explains many of the peculiarities we are obtaining with standard control recommendations," Jackson explains.

Houston Couch, Ph.D. of VPI-SU, who did most of the initial work on fusarium, says that there as many as 17 different diseases with similar symptoms. He has asked some fungicide manufacturers to specify which of the diseases their products control, and to change labels accordingly.

LEGISLATION

Judge approves use of diazinon

An EPA administrative law judge ruled in favor of diazinon manufacturers, but placed tighter restrictions on the insecticide's use.

Last year, the EPA proposed cancellation of diazinon's use on golf courses and sod farms stemming from reported bird kills. The decision was handed down Jan. 25 by Judge Gerald Harwood. It states that golf course and sod farm registrations for all products containing diazinon not be cancelled but placed under the "restricted use" classification. Harwood also ordered a change in diazinon product labels to include application restrictions proposed by Ciba-Geigy to reduce the risks diazinon application on golf courses and sod farms may pose to birds.

The decision is good news for golf superintendents, according to Bill Liles, director of the Turf & Ornamental Department at Ciba-Geigy, the major supplier of diazinon. "We are especially happy with the strong support we got from the GCSAA. The superintendents provided expert testimony at the hearings about how diazinon is an important tool for insect control in their operations."

ATHLETIC TURF

Musser Foundation breaks off NSTC

The Musser Foundation has told the National Sports Turf Council (NSTC) that it will have to stand on its own. The decision, made at the board of directors meeting in Houston last month, was unanimous, according to Musser president Frank Dobie, superintendent of Sharon Golf Club in Sharon, Ohio.

"It was time the council be launched on its own," Dobie says. NSTC began two years ago as part of the Musser Foundation. Last year, it moved its headquarters to the USDA office in Beltsville, Md.

NSTC had used about $6,000 of Musser Foundation funds, which Dobie says won't have to be paid back. But Jack Murray, first vice president of the Musser Foundation and NSTC co-chair, says the council has raised enough money to pay back the foundation.

The future of NSTC has not been determined. Murray called being separated from the Musser Foundation, "very disappointing." "We don't have a firm foundation," he says. "I thought we had it as an arm of the Musser Foundation."

But he still has high hopes for NSTC's future. Murray says he would still like to hire a full-time person or staff to run the NSTC and even lobby in Washington. "We need to get more input at the grass-roots level and to work with states, different leagues and high school athletic directors," Murray says. "Our best bet is to work through extention agents."

For the time being, NSTC will continue to work out of the USDA office in Beltsville, Md.

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ATHLETIC FIELDS

Athletic field care re-evaluated by Harper

Recent research is re-evaluating the way we look at caring for athletic fields.

Penn State's Jack Harper, Ph.D., notes that a good natural grass field will reduce injury, but that a bad natural field is just as dangerous as an artificial turf field.

He points out certain requisites for a good grass field. Coring, he notes, has become a major concern on natural grass fields because it causes too much compaction near the surface. This same problem also plagues golf courses.

The problem stems from tines penetrating to their appointed range, two to four inches, but packing soil down to that depth while penetrating.

But Harper emphasizes that coring is still a necessity and it should be done as frequently as possible—a minimum of three times a year. "You need more than one pass in one direction once a year," he states.

For cool-season grasses he suggests a heavy coring in early spring just after the turf has ended its dormancy. Also a light coring in late August before football season, each time using a dragging instrument to break up the cores.

His third recommended coring would be a heavy one at the end of the season without dragging, letting the elements break up the cores.

Harper also recommends overseeding annually, some between the hashes on a football field and near the goals on a soccer or field hockey field. He found over the last 10 years that early spring overseeding recommendations are changing from the too slow tall fescues and bluegrasses to the rapid turf-type perennial ryes.

The new turf types are the best, he says, but not perfect. The current recommended rate is 5 to 7 lbs./1000 sq. ft. For broadcast seeding, aerate, put down the seed and then drag so that the seed will fall into the holes and be covered. For slit seeding, aerate, slit seed in at least two directions then broadcast some also. Fertilizer should be added according to soil tests.

Penn State publishes a guide to athletic field construction and maintenance. The booklets are available from Dr. Harper at the College of Agriculture Extension Service, University Park, PA 16802.

Harper spoke on athletic fields at the Ohio Turfgrass Conference.

New to LANDSCAPE MANAGEMENT

Gloria Cosby, shown below, has joined LANDSCAPE MANAGEMENT as marketing representative for New England and the upper Atlantic seaboard. She will handle advertising sales for New York, New Jersey, Pennsylvania, Delaware, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire and Maine.

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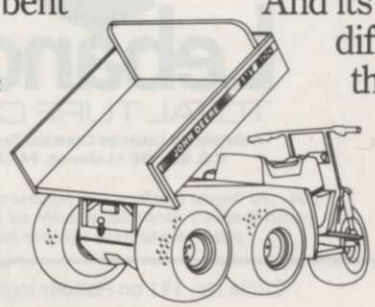
And its automotive-type differential allows the inside wheels to turn slower than the outside wheels. So the 600 won't tear up your turf turning either.



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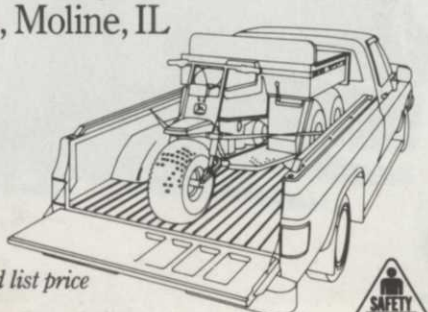

SAFETY live with it

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THE GREAT COVER-UP

When the Pope visited San Franscisco last fall, he appeared on a day between two baseball games. The athletic field managers at Candlestick Park used a special fabric to save the turf.

by Heide Aungst, managing editor

Papal pageantry filled the air. On September 18, 1987, Pope John Paul II would bless the city by the Bay.

San Fransiscans could think or talk of little else. While the city anxiously awaited the visit, however, Candlestick Park's field managers prayed the turf would hold up to the 10,000 people seated on the field, to say nothing of the Pope's entourage (including the Popemobile driving across it).

Barney Barron, superintendent of parks and recreation for San Franscisco, spoke with confidence the day before the big event: "I have great respect for the crew. They're used to working under pressure with time constraints. Sometimes we'll have a football game Sunday and a baseball game Monday," Barron explained.

The pressure Barron referred to meant laying 286,000 square feet of the Warren's TerraCover ground blanket. It would be the first time in history that a stadium would use two layers of TerraCover to protect the turf from wear injury.

"TerraCover is a 100 percent nonwoven polyester needlepunched fabric," explains Emory Hunter of Warren's. The fabric originally was made from recycled plastic pop bottles. But the company has since switched to a virgin polyester fiber. Candlestick used some of both types of the geotextile.

In the beginning

"We had heard nine months earlier that he (the Pope) would be coming to San Franscisco and that Candlestick was a possible site," Barron explained. "About six months ago, we heard officially."

After that word came, Barron met extensively with various city agencies, the U.S. Secret Service and San Franscisco's Archdiocese. "Once the date was chosen, it was up to Arch-

Pope John Paul II walks on the TerraCover fabric at Candlestick Park to greet worshippers.

Candlestick's crew, along with volunteers, starts to unroll the TerraCover to protect the field against wear.

diocese to get the Giants to give up a date," he said.

The Giants were scheduled to play the day before the visit, the day of the visit, and the day after the visit. By giving up the game on the day of the visit, they had to play a double-header over the weekend.

Once the date was chosen, the next step was to figure out how to put people on the field without hurting the turf.

Good and evil

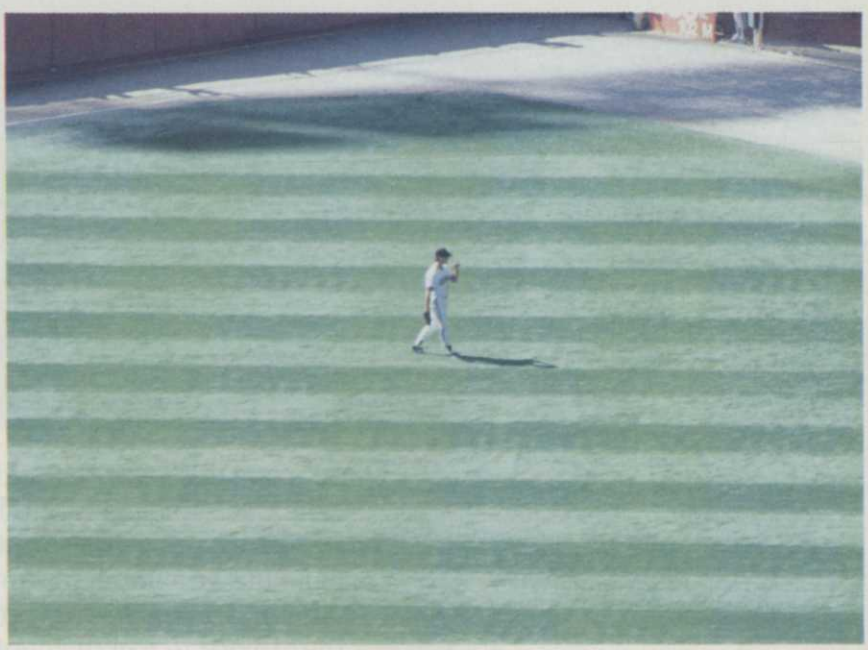
"We thought the only way to do it was to put plywood on the field, then cover it," Barron said. "But when the Archdiocese priced plywood and the labor cost involved..."

Chairs couldn't be used without first covering the field. Nightmares of a Rolling Stones concert in October 1981 haunted Barron. "We weren't prepared for the event and didn't have a cover of any sort," he said. "The field was severely devastated."

Barron didn't want the primarily A-34 Kentucky bluegrass/sand-based field destroyed again. He called Steve Wightman, field manager at Denver's Mile High Stadium, for advice.

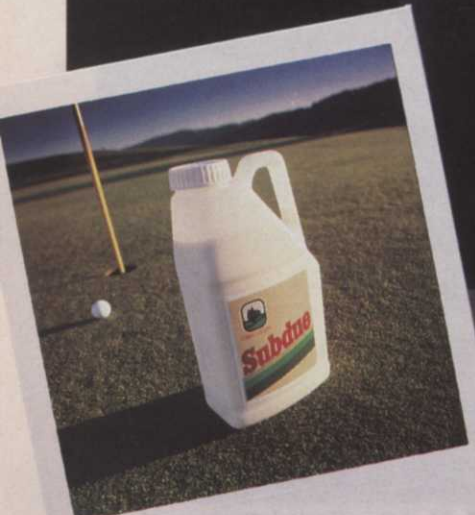
Wightman told Barron that he had successfully used TerraCover for rock concerts and along bench areas in Mile High. Wightman, however, uses only one layer of fabric as protection. "If you put chairs on one layer of fabric, the leg can push in and give a dimpling effect, like a golf ball," explained Barron. "That's not bad if you have time after the event to work on the field. So the Archdiocese suggested we use a double layer of the fabric."

Since no one had done it before,



The A-34 Kentucky bluegrass/sand-based field at Candlestick Park was in top shape during the Giants' game the day before the Pope's visit.

"Someone put a cart in the 7th fairway pond. My next-door neighbor bought his kid a set of drums. And I just found out my mother-in-law is moving in. But what really concerns me is Pythium."



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Barron and head field manager Joe DeDelCarlo set up a test at San Francisco's old Kezar Stadium. The crew put two layers of fabric on part of the field, then set up 20 chairs on top of the fabric. On top of the chairs, they piled 80-lb. sacks of fertilizer.

"We left it overnight," Barron said. "The next day we had an in-service training class sit on the chairs and get up and down." Then they pulled the fabric up. "Don Foreman (Giants' stadium manager) couldn't find one single depression," Barron said. "Based on the test, he gave us permission to use the fabric."

Workers bundled up, sipped coffee, but never stopped rolling and tacking the fabric.

Candlestick and the Archdiocese struck a deal. They would split the $60,000 cost of the fabric and each group would own one layer.

Judgment day

On Thursday, Sept. 17, the Giants beat the Cincinnati Reds. When fans cleared out of the stadium at 5 p.m., Candlestick's crew of eight and about 100 teenaged volunteers from the San Francisco Conservation Corp. gained possesion of the field.

Security tightened. No one could enter the stadium without passing metal detectors and showing proper identification.

The workers laid the first layer of TerraCover, staking it down every foot or so. Each roll measured 300 ft. by 15 ft.. Some rolls were cut to size.

With one roll down, another worker started to mark the fabric, 12 inches in, so that the next layer could overlap. After an hour or so, however, the crew got the hang of laying down the fabric without marking off the 12-inches first. It saved time, too.

As the sun set, the winds off the frigid Bay whipped through Candlestick. "We can get gusts of 80 to 90 miles per hour," Barron said. Workers bundled up, sipped coffee, but never stopped rolling and tacking the fabric.

They layed fabric over turf and over a plywood altar support. The altar would be built from scratch. As the night wore on, the turf disappeared under a double layer of TerraCover.

By 8 a.m. Friday morning, as devoted Catholics began to arrive by the busload, the workers finished the job. Most didn't even get to stay for the mass.

As expected, the Popemobile drove over the TerraCover-ed field. People rose up and down out of their seats in hopes of getting a chance to touch the Pope. Eucharistic ministers passed through the aisles giving communion.

The resurrection

Within several hours, mass ended. By about 4 p.m. Candlestick was clear.

continued on page 29

Emory Hunter of Warren's checks out the fabric before it is laid on the field.

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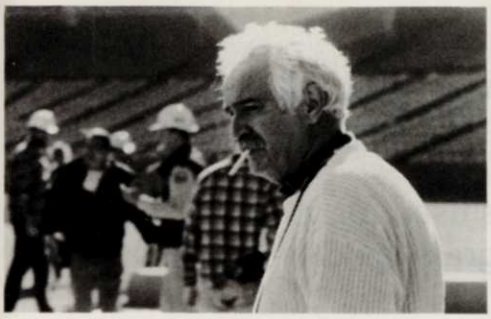
COVER-UP *from page 27*



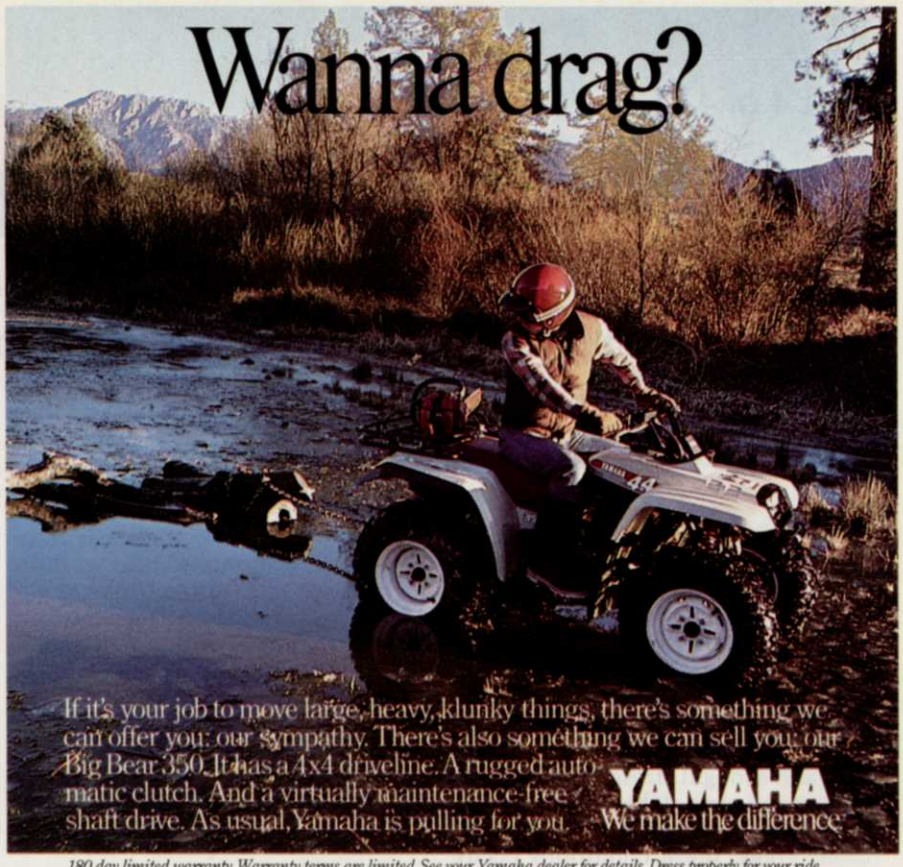
Barney Barron, San Francisco's superintendent of parks and recreation, oversees fabric laying.

The crew gathered long PVC pipes to re-roll the fabric and save it for the next big event. They rolled back each layer with eager anticipation. Would tire tracks show? Would there be dimpling from the chairs? Would the field be severely compacted from the traffic?

When exposed, the turf appeared slightly matted. It would need to be brushed upright. But no tire tracks or dimpling or severe compaction were evident. The TerraCover worked. "We'd definitely do it again," Barron said.

The next day the Giants played on the field. It looked striped and healthy. No one could tell that 10,000 people had trampled it the day before.

And the Giants won. **LM**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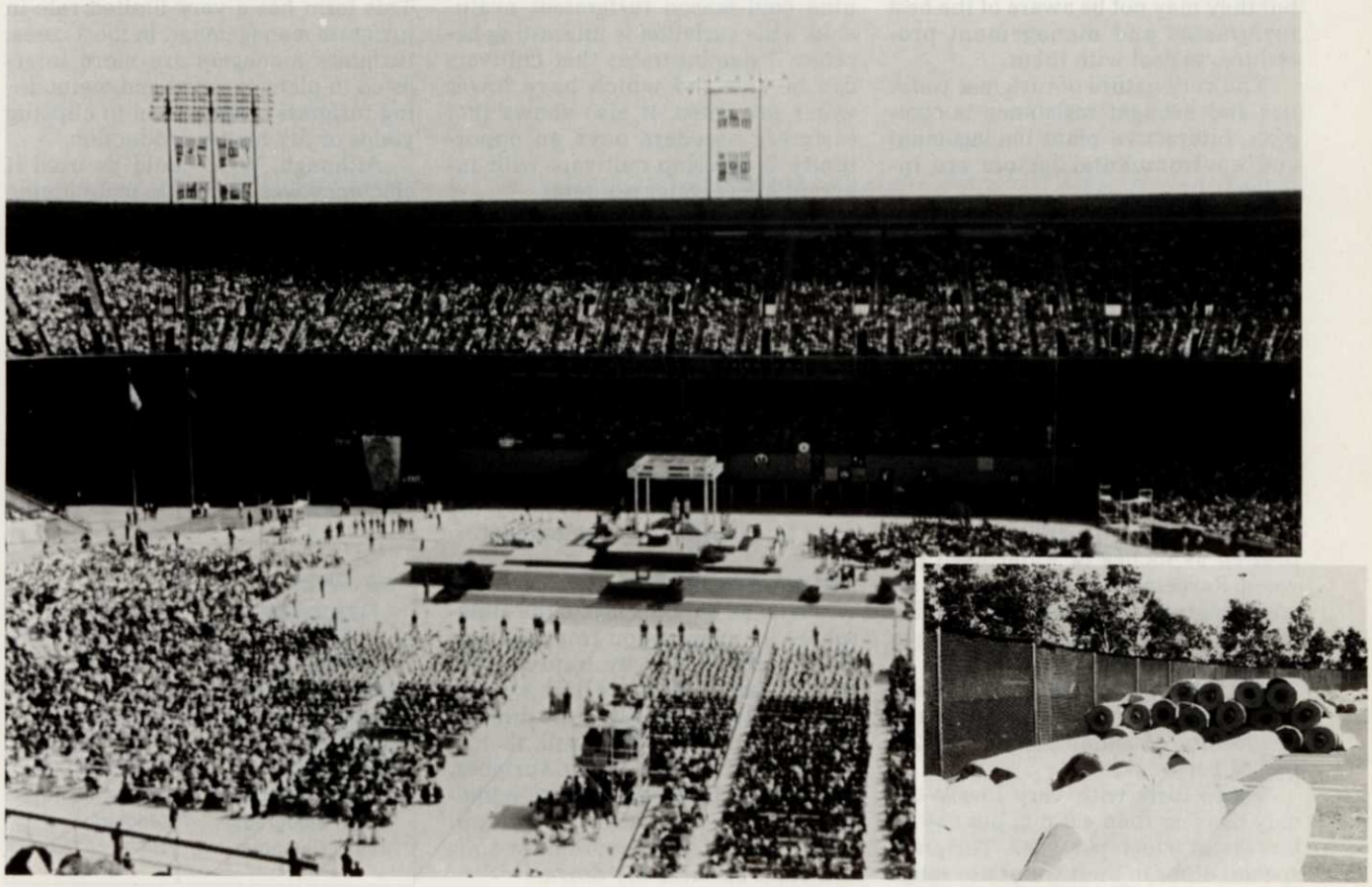

Two layers, totalling 286,000 square feet, of TerraCover, protected Candlestick's turf against wear.

Part 4 of 4

TURFGRASS WATER USE

Only one percent of the water applied to turfgrass is used for growth. Scientists are studying 'water use rate' of some turfgrass species for improved water savings.

by Robert Shearman, Ph.D., University of Nebraska

With the onset of water shortages and a growing awareness that water is a critical resource needing careful management, turfgrass researchers have placed an increasing emphasis on this area of research. More information is available to turfgrass managers which allows them to deal with water shortages and drought stress.

In many parts of the country, water shortages are an annual event. In other areas, these conditions occur occasionally, and the need for water conservation is much less predictable than in areas of regular drought stress. Most turfgrass managers are aware of water stress conditions in their areas, but they may not be aware of the best turfgrasses and management procedures to deal with them.

The very nature of turfgrass water use and drought resistance is complex. Interactive plant management and environmental factors are involved.

With this in mind, some of the terms used in this article may be confusing to the reader. An attempt will be made to clarify terms that may not be commonly used or understood by the reader.

Water use by the turfgrass plant is dynamic and interactive with the plant, environment, soil and cultural practices. Turfgrass water use rate (WUR) is the amount of water needed for growth, plus that used in evapotranspiration. WUR is typically expressed as inches of water used per week. Research publications often report water use in millimeters per day (25 mm equal one inch). According to research by James Beard, Ph.D., at Texas A&M University, turfgrasses with very high WUR may use as much as 9.0 mm of water per day or 2.5 inches per week.

Those turfs with very low WUR may use less than 4.0 mm per day or less than 1.0 inch per week. Turfgrass species differ in their water use rates. For example, the Table 1 contains a relative comparison of nine cool-season turfgrass species water use rates.

Similarly, turfgrass cultivars differ in WUR. Studies at the University of Nebraska have shown as much variation in water use within cultivars of Kentucky bluegrass as between the nine cool-season turfgrasses evaluated. This variation is interesting because it demonstrates that cultivars can be selected which have lower water use rates. It also shows that turfgrass breeders have an opportunity to develop cultivars with inherently low water use rates.

Water loss through evaporation occurs from soil, thatch, plant surfaces and water surfaces.

Other studies have shown that tall fescue cultivars differ in WUR, particularly when forage-types are compared with the new, improved turf-types.

The term "water use rate" is often considered to be the same as evapotranspiration rate. An estimated 99 percent of the water taken up by the turfgrass plant is lost to the atmosphere by evapotranspiration. The remaining one percent is used by the plant for growth and development.

Evapotranspiration

When water vapor is lost to the atmosphere by evaporation from soil and plant surfaces and by transpiration from plants, it is called evapotranspiration (ET). Water loss through evaporation occurs from soil, thatch, plant surfaces and water surfaces. Evaporative losses are greater immediately after irrigation or rainfall. They become less important as soils and other surfaces dry down.

Under these conditions, transpiration becomes more of a contributing factor to water loss than evaporation. The turfgrass roots actively grow and extract moisture from the soil.

This water is transported in the liquid phase in the plant. It is subsequently lost to the atmosphere as water vapor through pores in the leaf blade (stomata). Evapotranspiration could be considered a highly inefficient system. However, it serves as a driving force for nutrient uptake, translocation of nutrients and a cooling mechanism in plants.

Water use efficiency

The amount of dry matter produced per unit of water lost by the plant is termed water use efficiency (WUE). This term has a very limited role in turfgrass management. In most cases, turfgrass managers are more interested in plant survival and maintaining turfgrass quality than in clipping yields or dry matter production.

Although, WUE could be used if efficiency was related to maintaining turfgrass quality. WUE in relation to turfgrass quality would vary for the particular turf. For example, the effi-

TABLE 1.

RELATIVE WATER USE RATES OF 9 COOL SEASON TURFGRASS SPECIES

SPECIES	WATER USE
Tall Fescue	
Forage-type	Very High
Turf-type	Medium to High
Perennial Ryegrass	Medium
Kentucky Bluegrass	Medium
Creeping Red Fescue	Medium
Chewings Fescue	Medium to Low
Hard Fescue	Medium to Low
Creeping Bentgrass	Medium to High
Rough Bluegrass	Medium
Annual Bluegrass	High

Comparisons are based on turfgrass evaluations conducted at the University of Nebraska

ciency value for a golf green would be considerably different than that for a roadside utility turf.

Canopy resistance

The turfgrass canopy is the area of turf located from the thatch or soil surface to the tip of the blades. Canopy resistance is the mechanical impedence of water vapor and air movement by the configuration of the plants making up the canopy.

Evapotranspiration could be considered to be a highly inefficient system, but it can be a driving force for nutrient translocation and plant cooling.

Turfs with dense, tight canopies have greater canopy resistance than those with open stands. Once water leaves the leaf blade through the stomata, it travels as a gas in a path of least resistance to the atmosphere.

Water vapor gradients exist from the leaf surface, in the canopy, and to the atmosphere. Turfgrasses with low ET rates tend to be dense, low-growing types. Those turfs with high ET tend to have open canopies with a rapid vertical elongation rate. Canopy resistance plays an important role in water conservation of irrigated turfs.

Research from Texas A&M university has demonstrated the importance of canopy resistance in irrigated turfgrasses, especially with warm-season turfgrasses. Studies at Nebraska pointed out similar responses for Kentucky bluegrass turfs.

Turfgrass managers should be aware of the plant growth characteristics that influence a potential low water use rate:

- high shoot density
- high verdure
- dense leaves of narrow width
- horizontal leaf formation, and
- a slow vertical leaf elongation rate.

Selecting turfgrass species and cultivars with these characteristics can be helpful in water conservation. These characteristics can be manipulated with cultural practices. Depending on their intensity of use, they can benefit programs interested in reduced water use. **LM**

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TABLE 2.

A COMPARISON OF RELATIVE WATER USE RATES OF TALL FESCUE CULTIVARS

CULTIVAR	TYPE	WATER USE
Kenhy	Forage	High
Pastuca	Forage	High
Kentucky-31	Intermediate	Very High
Houndog	Turf	Medium
Adventure	Turf	Medium to Low
Rebel	Turf	Low

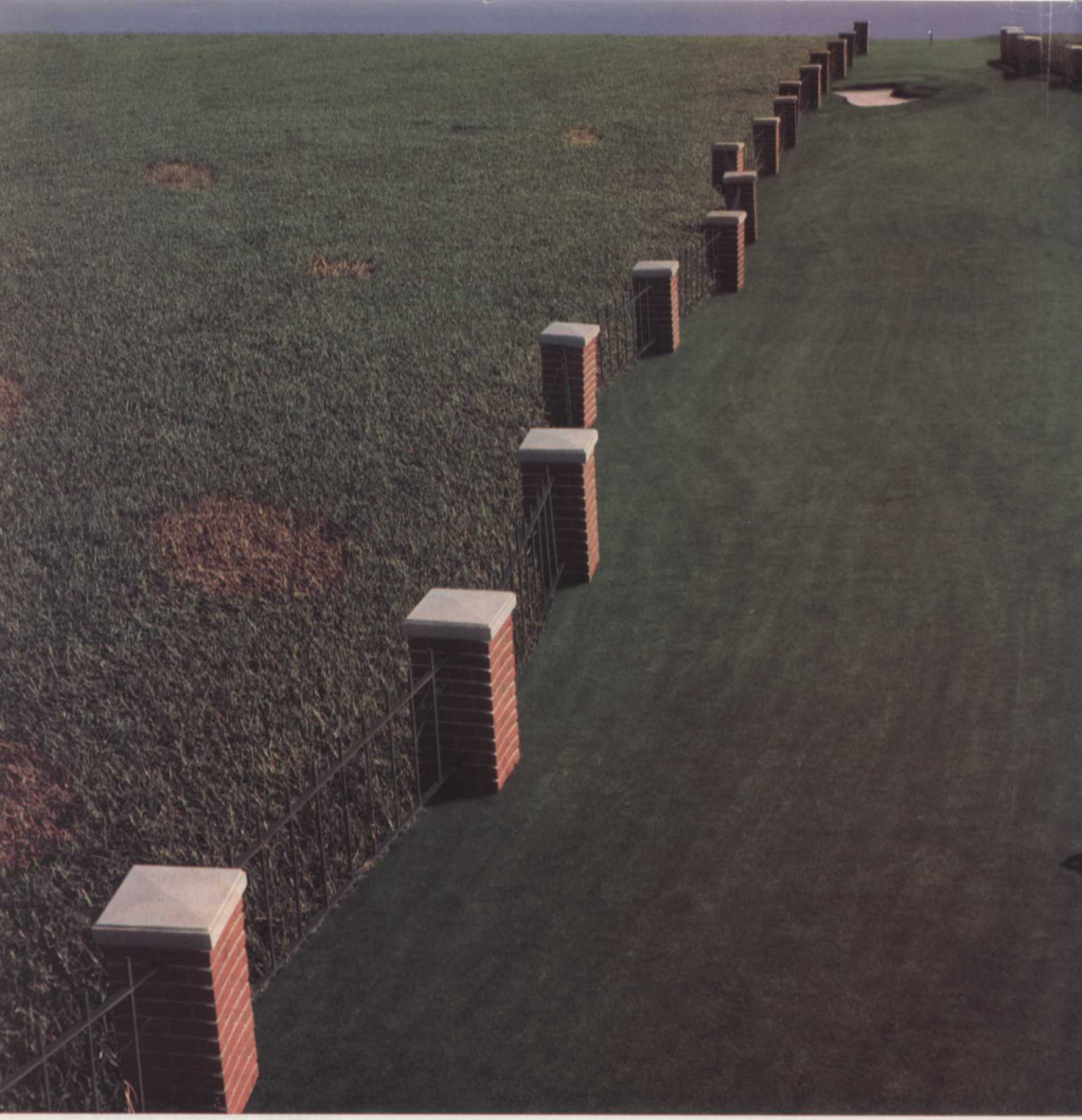
Comparisons are based on evaluations conducted at the University of Nebraska.

TABLE 3.

WATER USE RATES OF KENTUCKY BLUEGRASS CULTIVARS AND THEIR CANOPY RESISTANCE ASSESSMENTS

CULTIVAR	WATER USE	CANOPY RESISTANCE
Park	High	Low
Aspen	High	Medium to Low
Ram I	Medium to Low	Medium
Touchdown	Low	High
Sydsport	Low	High

Relative values are based on studies conducted at the University of Nebraska



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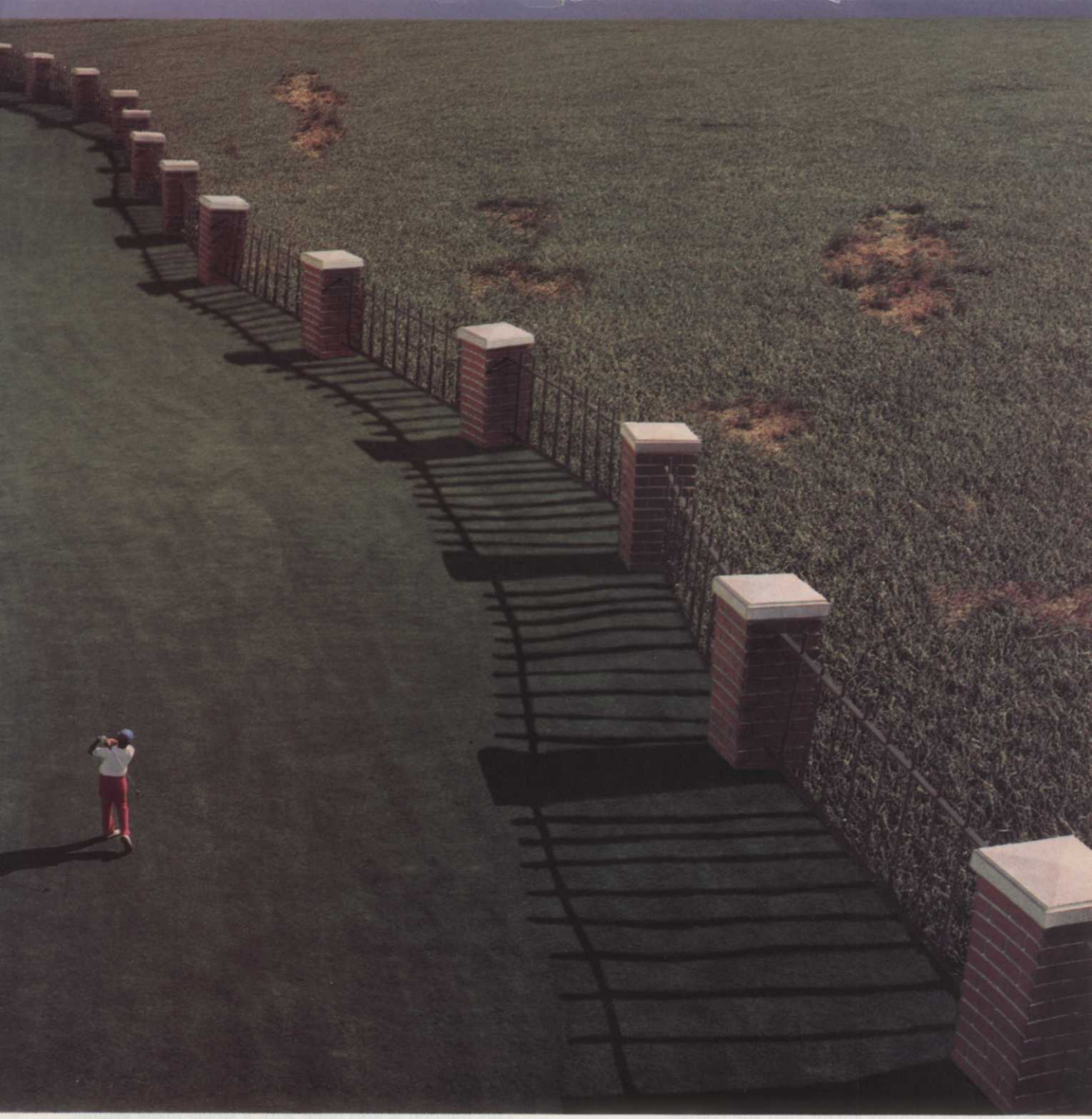

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COVER STORY

THE REEL ANSWER TO SPIN-GRINDING

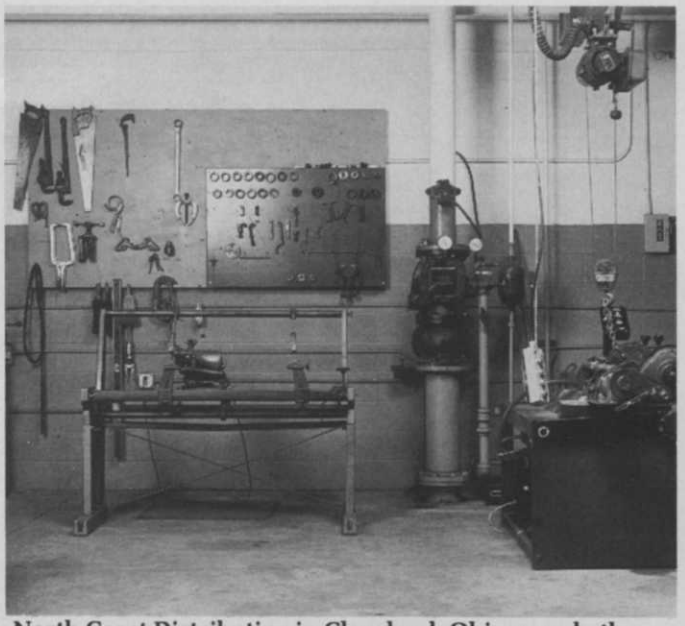
Herein lies the evolution of reel mower blade grinding and sharpening. By looking back at past sharpening methods, golf course superintendents can decide which current method is best for them.

by Roger Rosenquist

Today as never before, the question on the lips of golf course superintendents across America is: Which is the best way to sharpen the reels on our reel mowers?

Grinding equipment manufacturers continue to develop new and innovative equipment in response to the demands of getting the job done less expensively. With this development has come a confusing dilemma for the superintendent: the question of spin vs. relief ground mower reels.

Some point to the mower manufacturers and say they are spin-grinding their reels. Other point out, however, that most major manufacturers still provide reels with blade relief. The challenge is who is right, who do you—as superintendent—follow to get the best operating and most economical grinding job for your golf course.



North Coast Distributing in Cleveland, Ohio, uses both a single-blade relief-grinder (straight ahead) and spin-grinder (right), depending on the customer's preference.

To better appreciate how the controversy of relief and spun ground reels has come about, a review of the history and evolution of methods of grinding reel lawn mowers is the best way to explain the problem.

There are four shapes for reel blade cutting edges. Let's look at these shapes and examine how they are obtained. In the process, we will see the evolution of reel mower grinding.

The four cutting edge styles are:

1) single-point straight relief grind;
2) flat grind with relief;
3) cylindrical grind; and
4) cylindrical grind with relief angle.

Types of grinding

Single-point: For a single-point straight relief grind, the blades are ground to a sharp edge one blade at a time. These are ground by manually traversing a carriage on a single-blade grinder. The traversing speed varies as you enter and exit the blade, making it more difficult to control roundness. Roundness also is more difficult to control when grinding to a sharp edge.

After grinding the reel, the bedknife is adjusted to the reel. Backlapping is then done to obtain a land area on the tip and to create good cutting action. Backlapping takes more time, but it is necessary with this style of blade grinding.

Flat relief grind: For a flat grind with relief, the front edge is ground first to create a flat front land area. The land is to hold the reel roundness to a closer tolerance on the diameter. It also decreases backlapping time. Here you backlap for proper clearance and roundness.

This method is also done with a single blade grinder. This is an improvement over the single-point grind, as it creates a land area to reduce backlapping time.

Cylindrical grind: For a cylindrical grind (spun ground), the reel is rotated as the grinding wheel is traversing. This is accomplished on a machine called a spin grinder.

Spin grind creates a more accurate diameter control of the reel. A properly spun-ground reel should not need backlapping.

Relief cylinder grind: For a cylinder grind with relief angle, grinding machines have evolved to a point where you can spin-grind the diameter. As a second step, relief-grind while the reel remains set up in the position used while spin grinding. As in the simple cylinder-ground reel, the cylinder-ground reel with relief and a straight bedknife should not need backlapping.

Relief grinding is used by most mower manufacturers for their reels. This is done for lower horsepower require-

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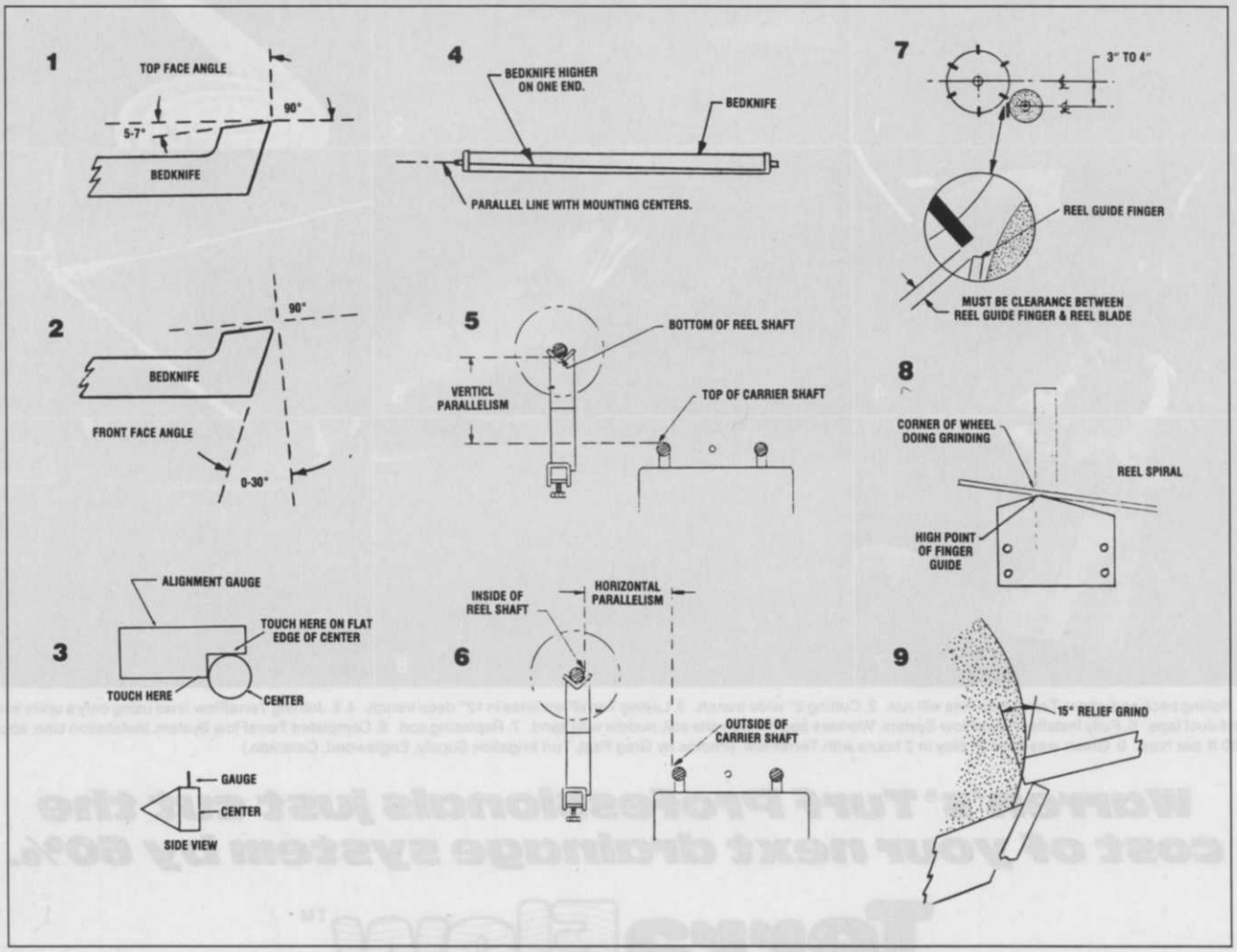

ments and less friction contact area for longer wear between bedknife and reel. A spun-ground reel with relief angle creates the ultimate in reel and bedknife life and performance.

To recap, we see the evolution in styles of reel grinding as the search for mower performance and grinding efficiency takes place. First came the straight relief ground and backlapped reel; then the flat-ground relieved and backlapped reel; next the cylindrically ground to improve roundness and straightness; and finally the cylindrically-ground reel with relief for the best advantages of all types.

Here again, a properly spun-ground reel with a good straight bedknife should not need backlapping.

This, basically, is the four-step evolution of reel grinding. Here now is the procedure to grind a mower unit. There are five steps to the proper basic maintenance of a mower unit.

For all four types of blade grinds discussed, there is a five-step procedure resulting in proper mower maintenance and a well-ground reel.

1. Maintenance: Before grinding reels, first clean and service the mower unit according to manufacturer's specifications.

2. Grind the bedknife to the manufacturer's recommendations of top and front face angles (Fig. 1). Position the bedknife into the grinding machine using the bedknife's mounting holes (Fig. 2).

Next, use the set-up gauge supplied with the machine to position the bedknife parallel (in vertical and horizontal planes) to the grinding head carriage (Fig. 3). This is necessary, as it is important to grind the bedknife straight as some manufacturers have only a 1/32nd adjustment allowable for setting the bedknife in contact with the reel at each end.

After set-up, grind the bedknife. Use only grinding wheels recommended by the grinder manufacturer. Grind the top-face edge first, then the front edge if necessary. On an automatically traversing grinder with a speed control, traverse at a slower speed on the last pass for the right surface texture of the grind. Always "spark out" the grind on the last pass. This means no in-feeding of the grinding head while the grinding wheel is traversing the knife blade.

A properly-selected grinding wheel and traverse speed should result in minimal wheel dressing to prevent surface glazing. Also, the in-feed amount controls dressing action on the grinding wheel to eliminate manually dressing the wheel.

Coolant is recommended for faster stock removal and to reduce heat build-up. If the blade edge gets too hot during grinding, without coolant you may have to let it cool before the final pass to hold straightness. Never get the knife edge too hot. That will cause the bedknife to lose its temper.

(A quick and easy way to check straightness of the top edge is to use a precision straight edge. Lay the straight edge across the top surface and check for gaps using a feeler gauge.)

Next, to grind a reel, mount the bedknife in the mower unit. To grind a reel mower, the entire unit must be mounted into the grinding machine. Before positioning the unit, however, some mowers need the bedknife to be mounted in part of the mower's main structure. In other

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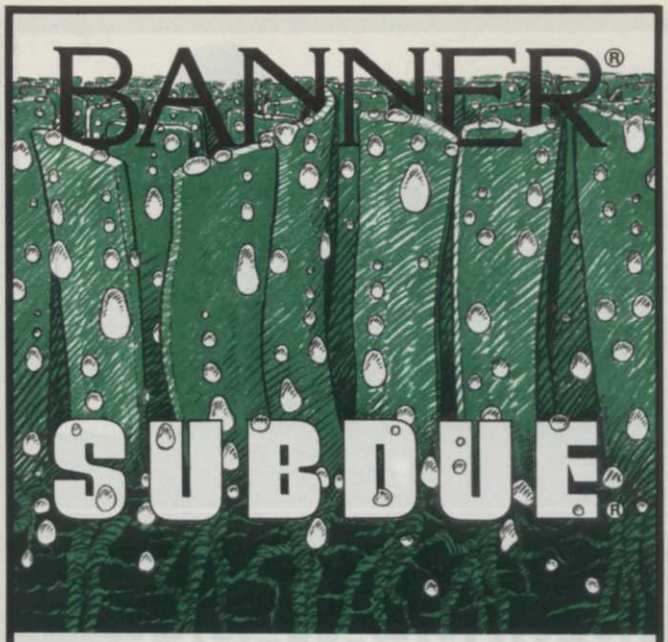

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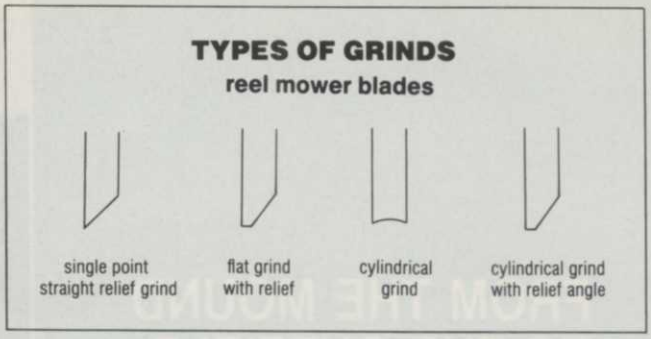

cases, the bedknife does't have to be remounted, such as when grinding wheel clearance is needed or the bedknife is ground during the reel grinding operation for efficiency.

When mounted, use the mower unit fixturing provided with the grinder. Next, use a set-up gauge to set the horizontal and vertical planes of the mower unit to the grinding wheel carriage traverse rails (Fig. 4, 5). Use the reel hub to check the reel's positioning. The more accurate this set-up, the less conical shape the reel is ground. Newer set-up gauges are using dial indicators rather than the touch method to hold reel positioning accuracy.

Now that we have a reel mower positioned for grinding, let's look at two types of reel grinders.

Single blade reel grinding: A single blade grinder grinds one blade at a time. These are manual traverse machines. This method uses a reel guide finger mounted on the traversing grinding head (Fig. 6). The reel blade rides on the high point of the guide finger.

For spin grinding, grinding the reel while in the cutting unit is preferable. The reel is rotated by a separate drive system. It rotates while the grinding head traverses to grind the outside diameter of the reel (Fig. 7). Spin grinding is for holding roundness accurately. Check reel roundness with a set-up gauge after grinding. Set the indicator rod on the reel's outside diameter and rotate the reel by hand to check blade-to-blade height variation.

It is now possible on at least one manufacturer's grinder to add a back relief grind (while maintaining the same mower position) to each reel blade after the reel is spun ground (Fig. 8). The back relief should conform to the manufacturer's original equipment design.

For controlling grinding dust, a collector chute is provided for a vacuum system. On some reel grinders, dust control is essential while spin grinding and relief grinding.

Clearance adjustment

To check reel-to-bedknife clearance:

First, position the bedknife in contact with the reel. Fold in half a piece of paper about .003 inches thick and, while rotating the reel, slowly cut the paper. Pass the paper down each blade the full length. At least one paper should be cut off.

If so, the reel is set to within .003 inches.

Backlapping may be required for whisper-quiet operation of the mower unit and also during summer use for minimal re-sharpening of reels. If a reel is spun-ground and the bedknife is ground properly, backlapping should not be needed.

Grinding machines for today's mower maintenance market have progressed such that spin grinding with the added final relief grind have accomplished two things: grinders that produce (1) near-original performance (2) at affordable costs. **LM**

Roger Rosenquist is product engineer for Foley-United, Industrial Products Division, Minneapolis, Minn., a leading manufacturer of mower sharpening equipment.

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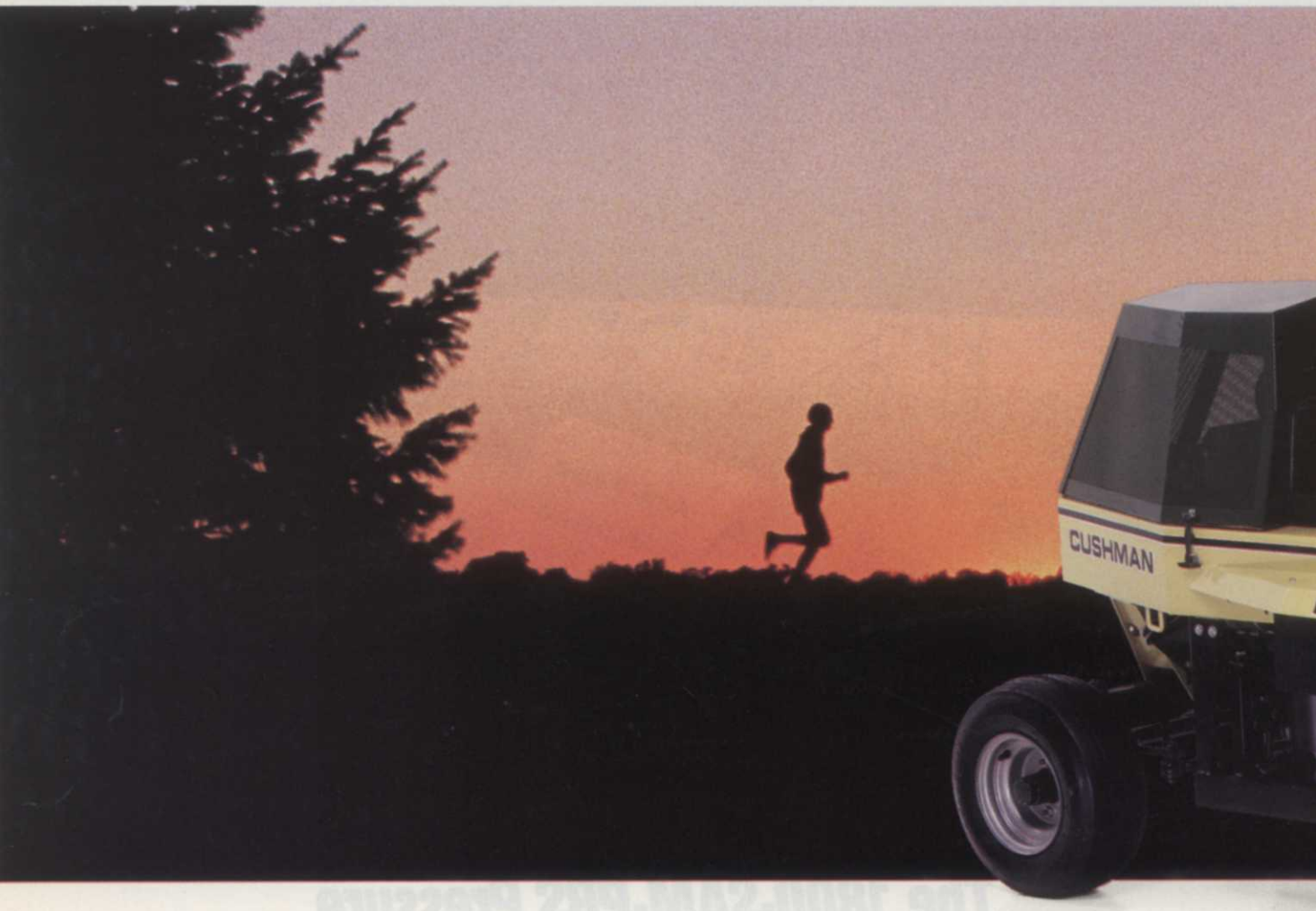

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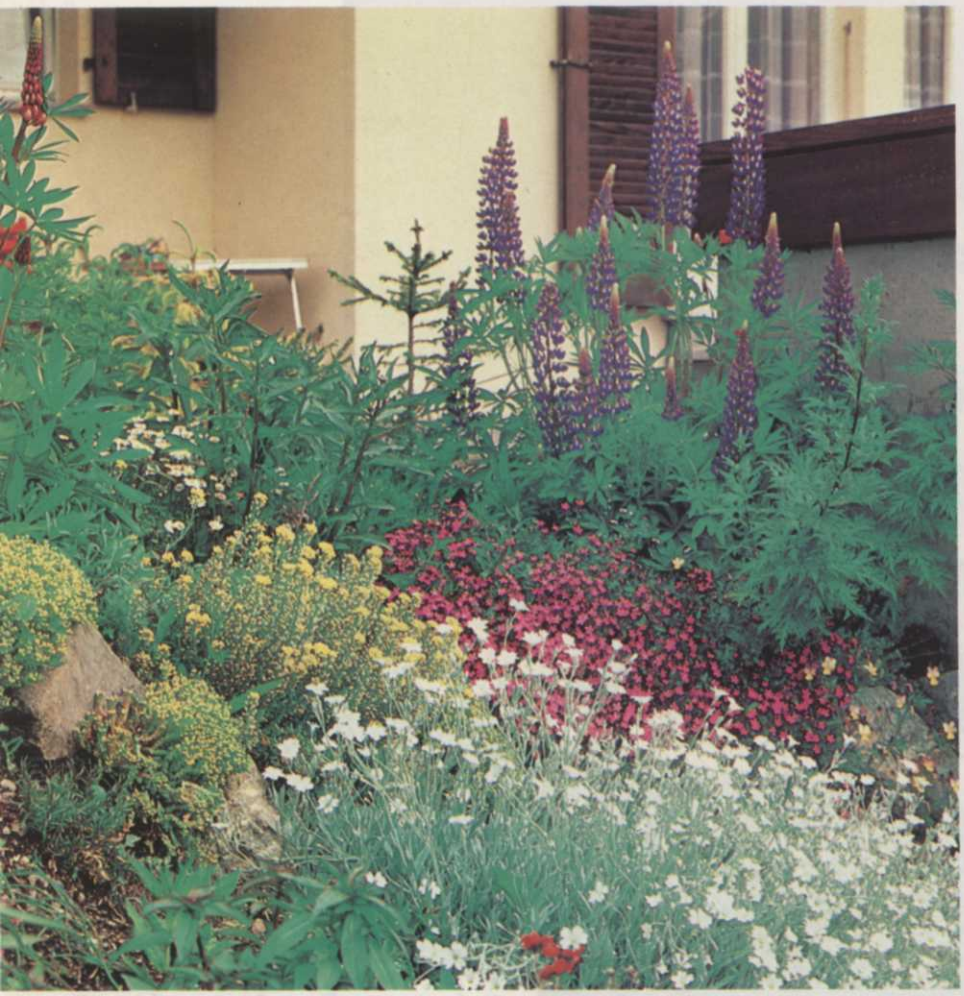
HERE TODAY... HERE TOMORROW

A perennial garden will bring color to the landscape year after year without the headaches of re-planting.

by Ann Reilly



Staudenbeet is one type of a low-maintenance perrenial.

Many cliches can be called upon to explain the explosion in popularity of perennials. It's true that they came back into style, just as old clothes, beards and hairstyles often do. It's also a fact that the tried-and-true have proven themselves again to be steady, reliable and dependable.

But the main reason that perennials are being used increasingly in all landscape situations is a simple one: they're good.

By definition, a perennial is a plant that will survive in the landscape for three or more years (as opposed to an annual or a biennial), going dormant each winter (generally with the tops dying down), and regrowing in spring.

The term "herbaceous" is often tacked on to "perennial" to distinguish the soft and fleshy stems of perennials from those of woody trees and shrubs. Bulbs, although fitting the definition, are generally classified separately because of their unique system of food self-storage. For purposes of landscape planning and this article, however, they will be treated as though they were one and the same.

Bulbs and perennials

The appeal of bulbs and perennials to the landscape manager is their versatility, low maintenance (with proper selection, as explained later) and permanence. Perennials adapt to every soil, moisture condition or light situation. They can be used in either formal or informal designs.

Relief of the year-round sameness of the landscape is achieved with perennial color without the replanting of annuals each year. Bulbs bring color earliest and can complement the spring flowering ornamental cherries, crabapples, dogwoods and other trees as well as shrubs. Where annuals will be used, perennials should be thought of as a regular seasonal backdrop and a critical part of the landscape plan.

Choosing a design

The beginning of any truly successful landscape is a thoughtful design. Before sketching anything out on paper, consider the following design criteria:

- From what angles will the landscape be viewed? What are the existing topographical and permanent features?
- Is the design to be formal or informal?
- What plants fit the design needs?

Let's start with location.

If the site is a small business, is the beauty of the landscape to edify the employees or attract passersby? Is it to be viewed from the street, from the employee cafeteria or from the conference room? If the site is a residence, does the homeowner want to enjoy it from inside in the breakfast nook or outside on the patio? Location also will determine whether the design will call for borders (viewed from one side) or for beds (also called islands and viewed from all sides).

Next, study the existing and permanent features. Are there fences or other buildings nearby? What color and design are they? Are there trees which will remain? If they are large, you'll need to consider shade. With smaller, flowering trees and shrubs, look to coordinate bloom time and color.

Is the landscape irregular, with slopes, hills and rock out-croppings? You'll have to keep your design in

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keeping with what you've got to work with from the aspects of size, scale, color and design.

An ultra-modern office complex would demand a formal, bold, warm-colored approach whereas a bank building with an early-American architectural style would call for something more informal. Steep slopes will call for more lowgrowing, ground-covering perennials. Note also the size, style and location of paths, parking lots, driveways and signs.

Your situation will command a decision about whether you should plan an informal or formal garden. If your site is open and flat, you are lucky in that you have more leeway to choose either style.

Formal or informal?

If you choose a formal design, you will tend toward straight lines, symmetry, a geometric shape and perhaps a single object such as a statue, pool or fountain to serve as a focal point.

Today's life and building styles are more likely to call for an informal approach, with a predominance of soft, flowing lines and a seeming disregard for symmetry. Curves frequently follow the natural terrain, making this type of design a must for hilly or wooded situations.

The final, and perhaps most important decision, is the choice of the perennials themselves to complete the scene. You must take into account the color, height, spread, form, texture, bloom season, light requirements, style, use and maintenance needs of the plants, combining them so the landscape will have variety and contrast while still being cohesive.

Color

Color has the greatest impact on your landscape. To learn a few basic principles used by artists, buy a simple color wheel and study complementary colors. Greens, blue and violets are cool; they recede, give a subdued effect, are best for close-up viewing. Reds, oranges and yellows are warm colors; they advance, create a dramatic affect, and catch your eye. Remember also that foliage has color as well as flowers. Artemisia and dusty miller, for example, add tones of silver and grey to the perennial border.

Height and forms

The height of perennials ranges from only inches to many feet. Place taller plants, like delphinium, lythrum, liatris and phlox at the rear of the border or center of the bed, with other heights graduated toward the front or the edge.

Low-growers like English daisy or forget-me-not will receive front billing. Some mixture of heights also keeps boredom away.

The forms of perennials are classed into three different shapes: spiked, rounded and prostrate. Combine a variety of these for interest, and repeat them for harmony. For example, you could combine the tall, upright liatris or lupines with the mounded gaillardia or doronicum, bordered by low growing sedum or candytuft. Consider, too, that flowers have different shapes as well.

Texture and bloom season

Texture refers to a plant's appearance. The small or dissected leaves of perennials, like yarrow, have a fine texture, creating a feeling of airiness. The large leaves of hollyhock are coarser and create a feeling of solid space.

Bloom season varies from plant to plant, ranging from spring to fall and usually lasting about one month. As an exception, coreopsis, gloriosa daisy and a few more bloom all summer long. Most gardeners plan for a succession of bloom: primrose for April, foxglove for May, poppy for June, scabiosa for July, phlox for August, liriobe for September and mums for October. These dates will vary according to your location. Coordinating all of this can be complicated and challenging, but fascinating as well.

Light requirement can be from full

Staudenrabatte provides a mixed border.

Popular Garden Perennials

Perennials are plants that usually live for more than two years. Their foliage and stems may die during winter but each spring new shoots emerge.

Use the chart below as a guide in selecting your perennials. Remember — regional, varietal and cultural differences may affect the performance of your perennials.

Name	Spacing (inches)	Height (inches)	Flower Colors	Season of Bloom	Light	Additional Information
Achillea filipendulina **(Fern-Leaf Yarrow)**	12-18	over 36	Y., W.	June-Sept.	Sun	Beds, cut flowers, dried arrangements.
Anthemis tinctoria **(Golden Marguerite)**	12	12-36	Y., O.	June-Aug.	Sun	Borders, beds, cut flowers.
Aquilegia sp. **(Columbine)**	18	18-36	W., Y., O., Pk., B., P.	May-June	Sun to Pt. Shade	Beds, borders, cut flowers, accents.
Armeria maritima **(Thrift, Sea Pinks)**	8	8-12	Pk.-Crim., W.	June-July	Sun	Rock garderns, borders, edging.
Artemisia ludoviciana albula **(Silver-King)**	36	36	W.	Aug.	Sun to Pt. Shade	Grown mainly for silvery leaves. Accent.
Aster x Frikartii **(Aster)**	36	12-36	Lav., B.	July-Nov.	Sun	Beds, fall accent.
Astilbe x Arendsii **(Astiibe)**	18-24	24-36	W., Pk., P., R.	June-Aug.	Sun to Pt. Shade	Moist location. Beds, borders.
Aurinia saxatilis (also Alyssum) **(Basket-of-Gold)**	18	6-12	Y.	Apr.-June	Sun	Trailing habit. Rock gardens
Bellis perennis **(English Daisy)**	12	4-6	W., Pd., R.	Jan.-Aug.	Sun to Pt. Shade	Slow-spreading clump. Borders, rocks gardens
Catananche caerulea **(Cupid's Dart)**	8-10	24	B., W.	June-Aug.	Sun	Borders, beds, dried flowers.
Cerastrium tomentosum **(Snow-in-Summer)**	12	6	W.	June	Sun	Silver-white foliage. Borders, rock gardens.
Chrysanthemum maximum **(Shasta Daisy)**	24	24 to over 48	W.	June-Oct.	Sun	Dbl. and Sg. flowers, Beds. accents, cut flowers.
Chrysanthemum morifolium **(Hardy Mum)**	24	12-48	P., R., Br., W., Y., Pk.	Aug.-Nov.	Sun	Borders, fall accents.
Coreopsis lanceolata 'Grandiflora' **(Coreopsis)**	15	24-36	Y., O.	All summer	Sun	Well-drained soil. Beds, borders, cut flowers.
Delphinium elatum **(Delphinium)**	18-24	36-84	W., Pk., B., P.	June-Aug.	Sun	Reblooms if old blooms are cut. Beds, cut flowers
Diathus Caryophyllus **(Carnations, Pinks)**	12-18	12-30	W., Pk., R., Y.	June-Sept.	Sun	Beds, borders, cut flowers.
Dicentra spectabilis **(Bleeding Heart)**	15	24-36	Rk.-R., W.	May-June	Sun to Pt. Shade	Beds, specimens.
Doronicum cordatum **(Leopard's-Bane)**	12	10-30	Y.	May-June	Sun to Pt. Shade	Beds, cut flowers.
Echinops exaltatus **(Globe Thistle)**	18-24	36-60	B.	July-Sept.	Sun	Tolerates dry soil. Borders, dried flowers.
Gaillardia x grandiflora **(Blanket Flower)**	10-12	24-36	O., Y., Maroon	June-Sept.	Sun	Beds, borders, cut flowers.
Geum Quellyon **(Chilean avens)**	10-12	under 24	Y.-O., Pk.-R.	June-Aug.	Sun to Pt. Shade	Borders, beds.
Gypsophila paniculata **(Baby's Breath)**	48	over 36	W., Pk.	June-Oct.	Sun	Beds, borders, rock gardens, cut flowers.
Heuchera sanguinea **(Coral Bells)**	12	under 24	W., Pk.-R.	June-Aug.	Sun to Pt. Shade	Edging borders, rock gardens, cut flowers.
Hosta sp. **(Funkia, Plantain Lily)**	12-15	10-24	W., B., Lav.	July-Aug.	Sun to Pt. Shade	Popular for foliage. Foundations, beds, borders.
Iberis sempervirens **(Candytuft)**	12	6-8	Pk., W.	May-June	Sun to Pt. Shade	Borders, rock gardens.
Kniphofia Uvaria (also Tritoma) **(Red Hot Poker)**	18-24	24 to over 36	W., Y., O., Pk.-R.	July-Sept.	Sun	Don't divide clumps Accents, beds
Lathyrus latifolius **(Perennial Peas)**	24	96-120	Pk.., W., R.	June-Aug.	Sun to Pt. Shade	Fragrant blooming vine. Trail up posts.
Lavandula angustifolia **(Lavender)**	15-18	18-36	P.	July-Sept.	Sun to Pt. Shade	Beds, borders, rock gardens
Liatris spicata **(Gay-feather)**	18	24 to over 36	B., P.	July-Sept.	Sun to Pt. Shade	Beds, borders, accents.
Linum perenne **(Perennial Blue Flax)**	12-18	24	B.	May-July	Sun	Borders, beds.
Lupinus Russell Hybrids **(Lupine)**	18	24-36	W., Y., B., Pk., R., P.	May-July	Sun to Pt. Shade	Beds, borders, cut flowers. Cool weather.
Denothera missourensis **(Evening Primrose)**	12	12	Y.	June-Sept.	Sun	Flowers remain open in day. Beds, Borders.
Papaver orientale **(Oriental Poppy)**	18	24-36	W., Pk.-R., S.	June	Sun	Beds. Foliage disappears during July and August.
Penstemon barbatus **(Beard Tongue)**	12-18	36-72	Carmine	July-Sept.	Sun to Pt. Shade	Provides good drainage. Beds.
Perennial Grasses are striking additions to most gardens. Many are tall growing for accent or background. Others are low and compact—perfect as edging. Foliage comes in shades of green and variegated.						
Phlox paniculata **(Phlox)**	24	24 to over 36	W., Pk.-R., B.-P.	June-Sept.	Sun to Pt. Shade	Reblooms if old blooms are cut. Medium background.
Primula x polyantha **(Primrose)**	10	under 12	W., Y., Pk., R., B., P.	May-June	Pt. Shade	Cool moist are. Beds. borders, rock gardens.
Rudbeckia fulgida **(Coneflower)**	12-15	24-36	Y., O.	July-Oct.	Sun to Pt. Shade	Background in bed.
Scabiosa caucasica **(Pincushion Flower)**	12-15	18-30	B., Lav., W., Mauve	July-Aug.	Sun	Borders, beds, cut flowers.
Sedum sp. **(Stonecrop)**	8-24	2-18	Y., R., W., Pk., P.	May-Aug.	Sun to Pt. Shade	Rock gardens, specimens. Dry soil
Sempervivum tectorum (Hen and Chicks)	15	3-8	Pk., R.	July-Aug.	Sun	Beds, Edging, rock gardens. Dry soil

Key to Colors:

Blue—B.	Lavender—Lav.	Red—R.
Bronze—Br.	Orange—O.	Salmon—S.
Crimson—Crim.	Pink—Pk.	White—W.
Dark Red—Dk. R.	Purple—P.	Yellow—Y.

Partially shaded areas are those which receive four hours or less of direct sunlight per day.

Flowers *from page 44*

sun through deep shade.

Spreadability

Some perennials spread more than others. You'll want to design the landscape so the plants are just touching when fully grown. This will impact that dramatic affect you'll observe in English gardens that seems to stagger the U.S. mentality. It's full but not crowded.

After you've chosen your design style, choose perennials that fit it as well. Tulips and hyacinths are so formal in style that they'd be difficult to use in an informal design; conversely, daffodils are informal plants and don't fit the formal garden well. Taller, stately perennials, such as delphinium and foxglove, find their best homes as well in the formal setting.

Using perennials

Uses of perennials don't stop in beds or borders. For an accent, try peonies or daylilies. For a hedge, astilbe or veronica. As a screen, loosestrife or false indigo. To unify a shrub border, grape hyacinths followed by hosta or coral bells. As a ground cover, ajuga, perennial geranium, sedum or creeping phlox.

Lastly, consider the amount of maintenance you can devote to the perennial plantings. Many plants you can choose need little or no maintenance: bulbs that don't need replacement or digging often and perennials that don't need frequent division, spraying, staking.

For example, tulips and hyacinths among bulbs; andiris, peonies, phlox and delphinium will demand more attention than choices like grape hyacinth, various squills, daylilies, hosta, coral bells, coreopsis, evening primrose, astilbe and gaillardia.

Planting and care

Perennials can be planted any time the ground is workable from spring through fall. In most cases, you'll be planting perennials from some sort of a container ranging from a pack to a gallon can. In the heat of summer, be careful when planting not to disturb the root ball, and take a little extra care after planting to keep well watered until established.

Incorporation of organic matter such as peat moss, leaf mold or compost will be beneficial for good growth. At the same time, add a phosphorus source such as bone meal or superphosphate to ensure good root growth.

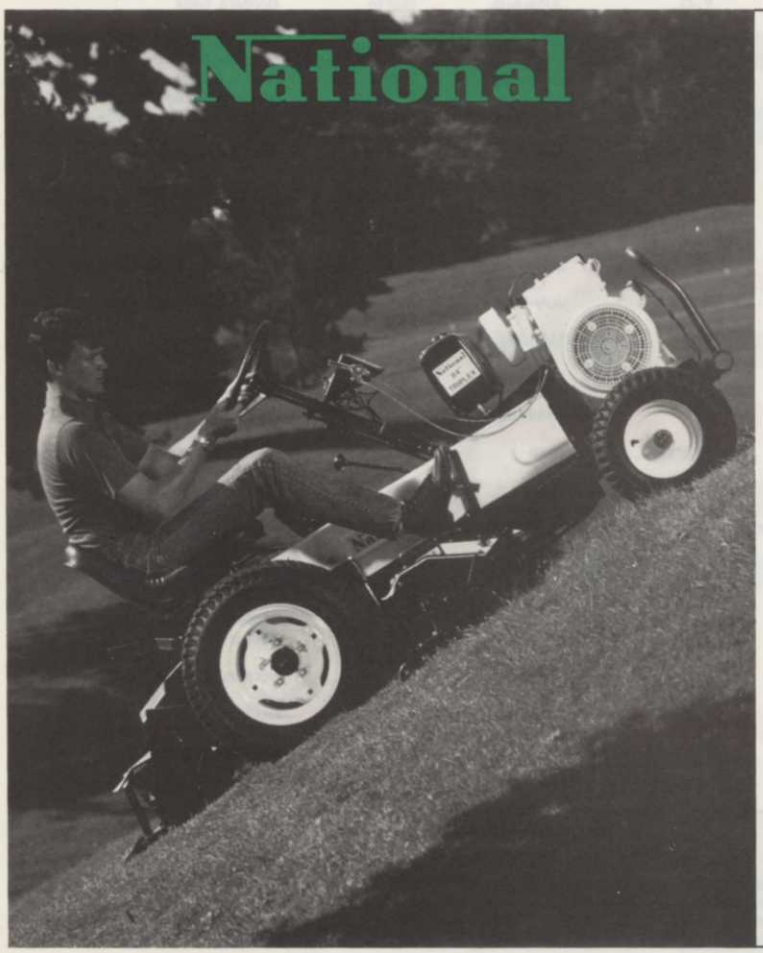
During the year, maintenance is not difficult. Removal of dead flowers when faded and an annual application of a balanced fertilizer, such as 5-10-5, are generally all that is necessary in addition to routine watering.

Perennials such as candytuft, basket of gold and others that hug the ground with profuse bloom benefit from a shearing with hedge clippers after they bloom to keep them compact.

Creating the perennial garden

A combination of your creativity coupled with the basics outlined is all you need to get started with using perennials in the landscape. Several suggestions for gardens are given. Simply choose some or all of the plants listed for a continuous bloom. The chart outlines color, height, spacing, bloom season and light requirements to help you further. **LM**

Bedding Plants Inc., a non-profit association dedicated to disseminating information on the use of flowers in the landscape, has free information available to assist you in planning the perennial garden. For your copy, send a self-addressed. stamped envelope to Perennials in the Landscape, 210 Cartwright Boulevard, Massapequa Park, NY 11762.



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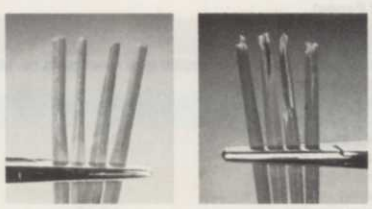

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Circle No. 175 on Reader Inquiry Card

Dr. Bill Daniel, left, shows Everett Mealman the excellent turf at Purdue Stadium where a PAT System has been in place since 1974. "I'll tell you this," says Daniel, "We've used a lot of Trimec here, and if there's a more beautiful campus in America, I haven't seen it." To which Mealman replies, "You and I see everything the same way."

A few words of wisdom for turf professionals from Dr. Bill Daniel.

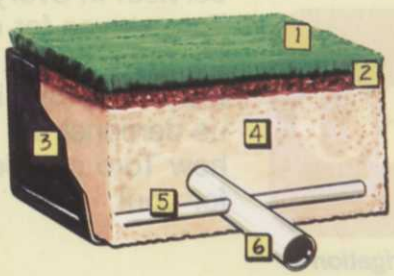
Anyone involved in the maintenance of ornamental or sports turf will benefit from eavesdropping on this conversation:

Very few in America have had more of an impact on the development of professionalism in the management of turf than Dr. Bill Daniel.

In 1985, Professor Daniel retired after 35 years at Purdue. Today he is actively marketing the patented Prescription Athletic Turf System (PAT) which he helped to develop during his years at Purdue.

The PAT System involves the installation and maintenance of natural turfgrass for athletic fields, which has all the virtues of outdoor artificial turf with none of the drawbacks.

The surface is level; is playable in any weather; divots can be quickly and easily repaired; the same system that drains off excess water can be reversed for sub-irrigation. The soil sensing within the PAT System permits automatic control of all phases — excess, normal, deficient — of water management.



Schematic cross section of PAT System. 1) Natural turf. 2) Mixture of peat and sand. 3) Plastic Liner on 4 sides and bottom. 4) Bed of sand. 5) Two-inch slitted tube. 6) Four-inch collector drain attached to suction pump.

The first PAT System was installed at Goshen Indiana High School in 1972 and is still in use. The system was installed in Denver's Mile-High Stadium in 1976, and the most recent installation is in Robbie Stadium in Miami.

For information about PAT, contact Turfgrass Services Co., 2202 Trace Twenty-Two, W. Lafayette, Indiana 47906, Phone 317-463-2202.

Mealman: "Dr. Daniel, I want to ask you a question. Actually, two questions."

Daniel: "Forget the doctor, call me Bill."

Mealman: "Okay, Bill, if you had the responsibility of explaining the difference between a Trimec® Turf Herbicide complex and a formulator tank mix . . . how would you do it? And the second question is: would it be worthwhile for a turf pro to spend the time and thought necessary to absorb the explanation?"

Dr. Daniel: "I'll answer the second question first by saying yes, it would be worthwhile for anyone involved in the management of turf to understand the difference between a tank mix and a complex. It's my belief that most people in the industry already know the difference but, even so, it helps to review things we already know.

"Knowing *what* a chemical does is one thing. But knowing *why* and *how* is equally important. Knowledge is power, and situations invariably arise where specific knowledge can be useful in deciding on the best course of action."

Mealman: "I've certainly found that to be true in my own experiences."

Dr. Daniel: "Now as to your first question. If I were explaining the difference in a classroom or a symposium, I would

devise a diagram showing the steps involved in reacting the acids of 2,4-D; MCPP; and dicamba into a complex and then indicate how this acid complex is formulated into Classic Trimec."

Mealman: "I notice you use a diagram to explain your PAT system."

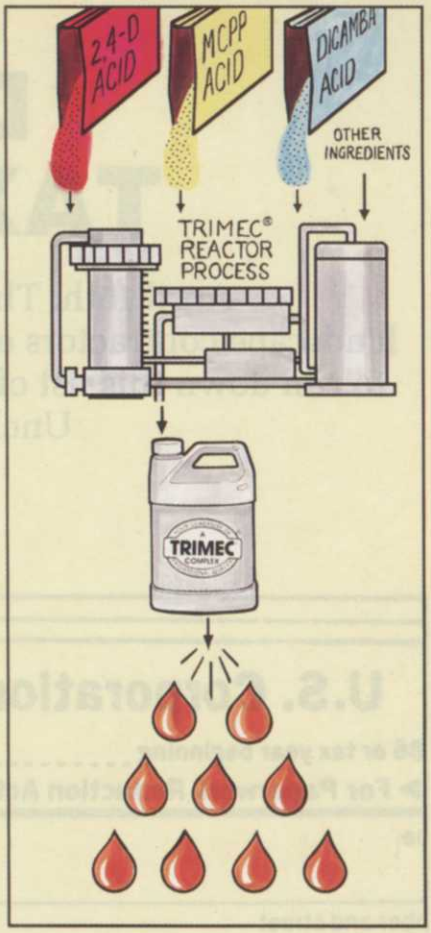
Dr. Daniel: "That's right, and it's been effective. But in your case I'd go one step further and also show and explain a diagram that describes how your original tank mix of a 3-way herbicide was put together in order to clearly demonstrate why a Trimec complex is more dependable and effective. Then I'd recount my own experiences with Trimec."

Mealman: "That would go back a few years."

Dr. Daniel: "Indeed it would. My first contact with Trimec must have been about 1970. I was teaching at Purdue when Lou Harris, Skip Skaptason, and George Walter brought samples of Trimec to test. They explained that it was a formulation of 2,4-D, MCPP and dicamba, and that the right to combine these chemicals was covered by a patent held by PBI/Gordon. In test plots it did a better job of controlling broadleaf weeds than any other turf herbicide on the market at that time. All of your men received copies of research reports every year."

Mealman: "Oh yes. George and Skip carried those reports everywhere they went. You never saw a more dog-eared bunch of papers. And then, beginning in 1975, the reports started looking even better . . . that, of course, was when we discovered an efficient way to react the base acids together and form a complex rather than a tank mix."

Dr. Daniel: "Yes, I remember. The differences were not dramatic, but they were certainly discernible and consistent. In ag, where 80% weed control is considered acceptable by most, the difference between your original tank mix and your complex may not have been important. But in ornamental turf, where cosmetic excellence is dependent on *complete* weed control, relatively small differences can be important."



Color code: Red, 2,4-D; Yellow, MCPP; Blue, dicamba; Amber, complex acid. Note: Colors are for code only and do not in any way indicate the color of the product they are intended to identify.

Schematic drawings show the differences between a tank mix and a complex.

These schematic drawings indicate that in a formulator's tank mix (left) the molecules of 2,4-D; MCPP; and dicamba, do not combine to form a new molecule. Accordingly, each droplet will contain its own unique amount of one or more of the ag chemicals, and control may vary from droplet to droplet.

In a complex (right) the 3 acids are reacted together to form a salt complex. When this is formulated with the other important ingredients, wetting agents, dispersants and sequestrants, as well as with continuous analytical monitoring including the use of a high-pressure liquid chromatograph, the unique product that is Trimec becomes a reality. Every droplet is an exact mirror image of the total, and thus precisely optimizes the intended synergistic activity.

The diferences between a tank mix and a complex become major when the goal is cosmetic excellence.

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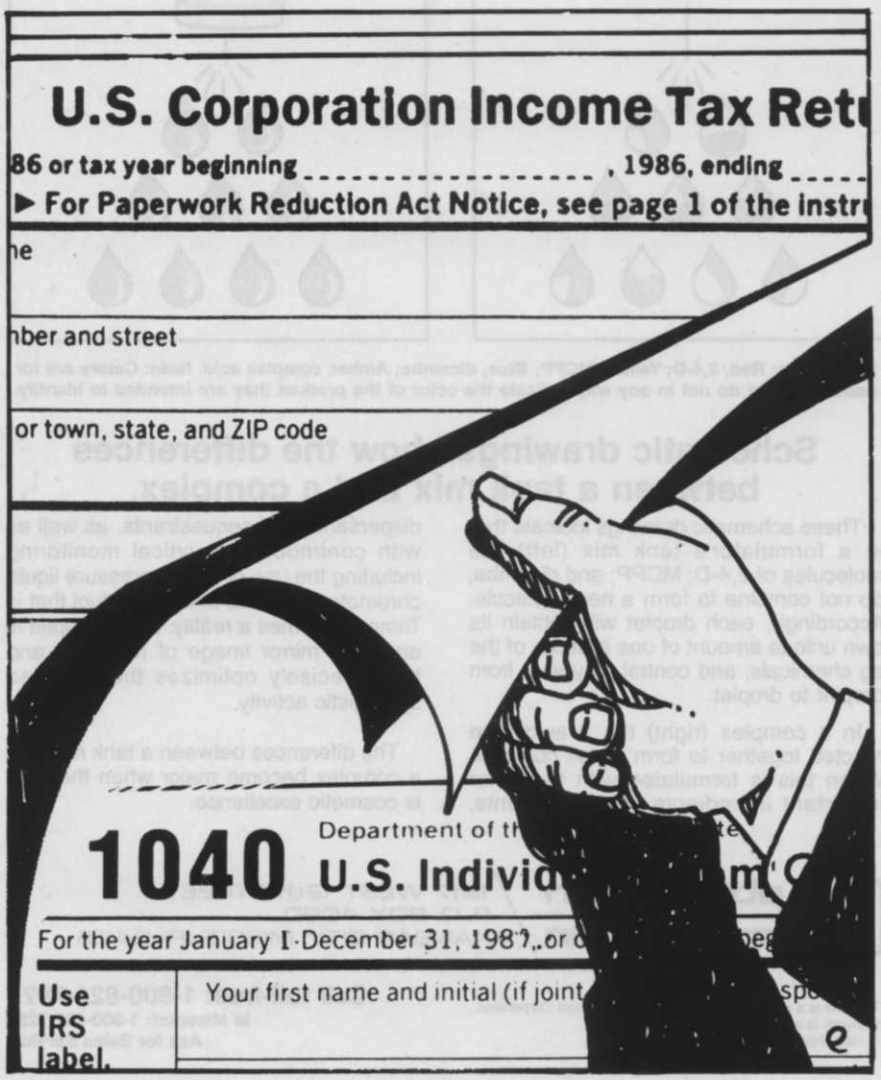
Circle No. 158 on Reader Inquiry Card

DEADLINE TAX PLANNING

April 15th. The date that strikes fear into the hearts of landscape contractors everywhere. As it fast approaches, you might want to run down this list of hints that can help reduce the amount of money Uncle Sam picks from your pocket.

by Mark E. Battersby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This is a confusing time of the year. The tax year for the landscaping operation has ended, cutting off all hope of making any more tax-saving moves. Plus, the impact of the Tax Reform Act of 1986 is just finding its way onto the annual tax return.

Fortunately, there are still quite a few good moves that can be made to substantially reduce that tax bill.

'Depreciation'

One good example of pre-filing planning is provided by equipment or fixtures bought before the year's end. On the surface, it might appear that the landscape contractor has only two choices: straight-line depreciation or accelerated depreciation. But look at the basic depreciation rules.

As every landscaper knows, business and income-producing property (other than land) generally lose their usefulness or value over a period of time. Our tax rules permit an annual deduction or "cost recovery" of a portion of the cost. Under our present tax rules, cost recovery is normally accomplished by using statutory accelerated methods. Long gone are the concepts of "estimated useful life" and "salvage value." This almost eliminates arguments with the Internal Revenue Service about depreciation, formerly a consistent source of litigation.

Depreciation or cost recovery currently looks like this:

- Personal property: accelerated 200 percent declining balance depreciation will be allowed for three-, five-, seven- and 10-year class property. Business autos and light trucks are now classified as five-year property.
- Luxury autos: ACRS (accelerated cost recovery system) deduction is limited to $2,560 for the year in which the auto was placed in service, $4,100 for the second year; $2,450 for the third year; and $1,475 for all later years.
- Real property: Straight-line depreciation over 31½ years for all commercial property. Now is the time to not only place newly-acquired property into the proper asset class, but to decide whether the ACRS method would be more beneficial in the long run than the only existing alternative, straight-line depreciation.

Another tactic that requires thought is the first-year expensing option. Up to $10,000 of so-called "personal property" (signs, desks, mowers, tractors, typewriters, computers, etc.) can be expensed or imme-

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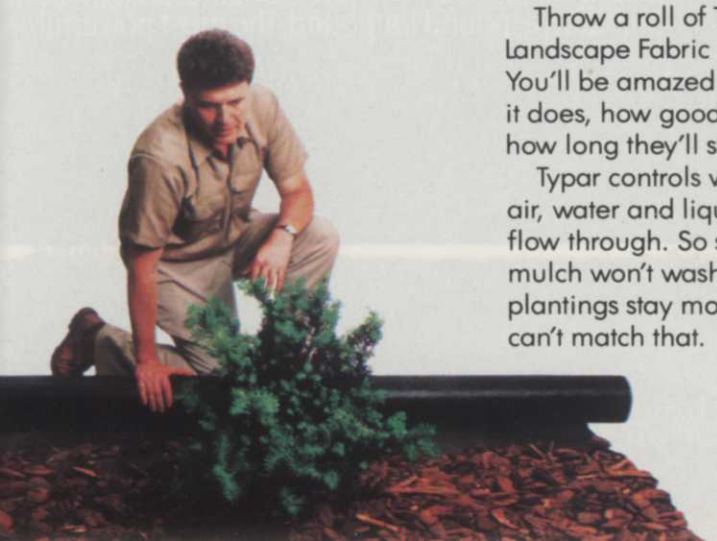

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diately written off. Those write-offs, however, are subject to a phase-out on a dollar-for-dollar basis where the landscaper's total investment in qualified property exceeds $200,000 for the year.

Although asset expenditure or acquisition may have already been made, it still must be decided whether the expense is currently deductible or can only be deducted ratably over the depreciation period. Unlike the costs of running a landscaping business which are currently deductible, expenditures for items of a more permanent nature (i.e., lasting more than a year) generally must be capitalized.

Profit or loss?

Whether the landscaping operation actually made a profit or lost money is something else that can't be determined with any degree of accuracy until after the close of the tax year. At either end of the spectrum, tax decisions must be made before filing the annual income tax return.

First, those losses: a so-called "net operating loss" (NOL) arises when the expenses of a business exceed the income earned. An NOL is first carried back three years and, if not absorbed, carried forward for up to 15 years. Or the landscape contractor can choose to give up the carryback altogether.

Giving up the carryback might be appropriate when a landscaper, whose prior three years' income was taxed at low rates, expects to be in higher brackets in the future. Or when a landscape contractor used the preferential long-term capital gain rates in prior years.

It may be difficult to conceive, but under our tax law, there is such a thing as too much profit.

In other words, if a loss resulted and sufficient income has been reported during the previous three years, then compare the tax benefits of a future-year deduction with an immediate cash refund. If last year was bad—but not bad enough to produce a loss—were estimated taxes overpaid?

The incorporated landscape contractor can apply for a "quickie" refund of those overpaid taxes. This must be done after the year has ended and before the income tax return is filed and, in any event, no later than 2½ months after the end of the tax year.

It may be difficult to conceive, but under our tax law, there is such a thing as too much profit. Unless there is a proper business reason for a landscaping corporation to accumulate earnings in excess of $250,000 ($150,000 for certain personal service corporations), a penalty may be assessed of 27.5 percent on the first $100,000 of current year excess and 38.5 percent on the balance. For 1988, and thereafter, a flat rate of 28 percent is applied.

Profitable landscape contractors should carefully document the business reasons for accumulating earnings. These should be specific both as to the proposed use and the amounts needed. Plus, there is also the "2½-month" rule which can be used as another avenue of escape from this penalty. What could be easier than paying dividends within 2½ months after the year ends?

The "2½-month" rule allows shareholder income shifting, which

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might also be valuable for other reasons. If the dividends are large enough, the penalty tax problem would disappear for the current tax year.

Splitting income

An often-overlooked method of splitting income among family members involves giving stock in an S corporation to the minor children of parents who are also stockholders. This usually involves transferring the stock to one of the parents as custodian under a gifts-to-minors act—a transfer that should have occurred prior to the end of the tax year.

Any income over $500 attributed to a minor from this transfer will be taxed at the highest marginal rate of the parents if:

- income is split among family members as a result of such a gift made in earlier years;
- the minor is under 14; *and*
- the parents are in a higher tax bracket than the minor.

Organizing records

Now is also an excellent time to put all of the contracting operation's records in order. They will not only be needed to properly prepare the income tax return but also to comply with the new tax law.

Nowhere is this more evident than under the rules governing meals and entertainment. All landscape contractors need to review their accounting system to assure that meal and entertainment expenses not be subject to the new 80 percent rule are separately identified. Plus, a review of the accounting records should be made to determine if they meet the new rules and substantiation requirements.

The Tax Reform Act of 1986 limited the deduction for meals (including meals incurred while away from home) and entertainment expenses to 80 percent of the amount that is otherwise tax deductible. Fortunately, this 80 percent limitation does not apply to the following items:

- items taxed as compensation or excluded under the *de minimis* fringe benefit rules;
- reimbursed expenses (the contractor making the reimbursement is the one subject to the 80 percent rule);
- traditional employer-paid recreational expenses for employees and their spouses (e.g., holiday parties and summer outings); and
- meals provided in 1987 or 1988 as an integral part of a banquet meeting where more than 50 percent of the participants are away from home, at least 40 people attend and the banquet includes a speaker.

Once the records are assembled, it is a simple matter to pick out expenses that may get lost in the tax filing shuffle. Medical expenses, for instance, may be relegated to the personal income tax return as they have been in the past—but perhaps they no longer should. Normally, medical expenses are only deductible as an itemized expense on landscapers' personal income tax returns. Self-employed contractors, however, may now claim a business expense deduction for 25 percent of their health insurance premiums for themselves, their spouse and their dependents.

It should be obvious by now that many things can still be done before the deadline for filing that income tax return that will substantially reduce the annual income tax bill.

Even with the assistance of a professional tax return preparer, the bottom line rests in the hands of the landscape contractor. **LM**

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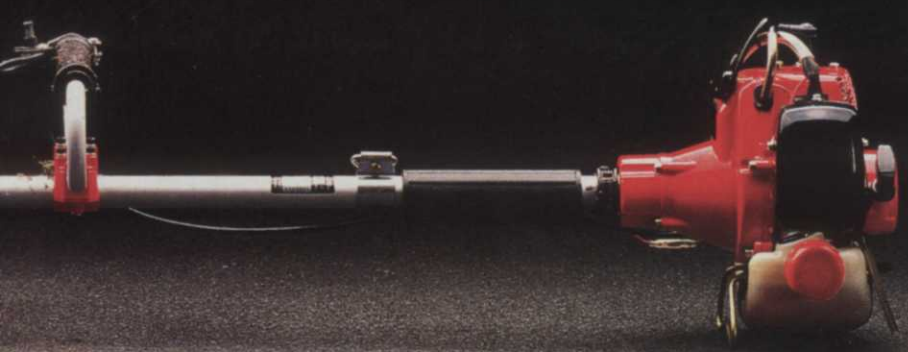

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Circle No. 266 on Reader Inquiry Card

by Heide Aungst, managing editor

LIGHTS...LAN

The historic buildings at the General Electric Nela Park headquarters in Cleveland, Ohio are lit with 70-watt reflector Lucalox (high pressure sodium) lamps. The Deluxe Lucalox lamps provide high efficiency and low operating cost, while giving off a whiter light. The incandescent-like color works best in areas used by people, while it won't distort the appearance of foliage. A photoelectric sensor automatically turns the lights on at dusk. The two small bullet-shaped lampholders are mounted on the roof parapet and aimed to light the herringbone walkway and planting bed of colorful annuals. The walk connects G.E.'s Lighting Institute and Treasury Buildings, both dating to around 1925. The bentgrass turf is carefully manicured. The trees, including a large yellow birch and small amelanchiers enhance the historic buildings.

General Electric: Circle No. 302 on Reader Inquiry Card.

Toro lighting provides security for the residents of this neo-Victorian home in Edina, Minn. The low-voltage lighting from Toro's "Combination Kit" includes six accent lights, four flood lights, a power pack and 100 feet of cable. The accent lights run on along both sides of the front sidewalk. Flood lights at the base of the porch's latticework gives off dramatic shadows, while highlighting architectural details. The lighting also adds to the aesthetics of the landscape. Two flood lights at the base of the large red oak tree give it definition. Landscape architect Jim Brewer planted tauton yews in the beds in front of the porch. Fond du Lac limestone edging surrounds gold flame spiraea bushes. Dwarf Amur maples line in the front beds.

Toro Lighting: Circle No. 300 on Reader Inquiry Card.

Jim Brewer: Circle No. 301 on Reader Inquiry Card.

gn

DSCAPES...ACTION

Schlumberger Well Services of Austin, Texas looks at landscapes diffently than many other companies. They chose this site overlooking a bluff for their research group's offices made up of six buildings. Landscape architect J. Robert Anderson worked with the company to reconcile and preserve the natural surroundings along with the buildings. Anderson used Hubbell lighting to keep the landscaping theme viable for day and night. Anderson promoted tree-mounted downlighting and ground-mounted uplighting fixtures, rather than traditional poles or building fixtures. He mounted the mercury-vapor downlights in live oaks, red oaks and cedar elms throughout the site. Wide-angle mercury vapor flood fixtures uplight the trees' foliage and canopy. Anderson views each building's landscape as separate. "The lighting helps visitors experience this diversity of landscapes by careful selection and placement of each fixture," he says. Stone walkways which wander through woods and courtyards (pictured here) give harmony to nature and architecture. The directional lighting from the trees casts a moonlight effect on the paths, bringing out the irregular joints of stone. The project used more than 200 mecury vapor light fixtures; more than 150 100-watt mecury vapor downlights with custom-made directional shields; 50 175-watt uplights with custom glare shields; and 20 in-ground well lights, which gives nighttime appeal to newly planted trees.

Hubbell Lighting: Circle No. 303 on Reader Inquiry Card.

J. Robert Anderson: Circle No. 304 on Reader Inquiry Card.

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THATCH

A deep build-up of thatch above the soil surface can mean trouble to turfgrass managers. One of the nation's foremost experts on thatch tells readers what it is and how to get rid of it.

by A. J. Turgeon, Penn State University

Soil organic matter may occur as largely indistinguishable additions to soil mineral matter, or as organic residues in or above the soil surface. The usually undecomposed, tightly intermingled layer of organic residue generated by the turfgrass community just above the soil surface is called thatch.

Causes of thatch

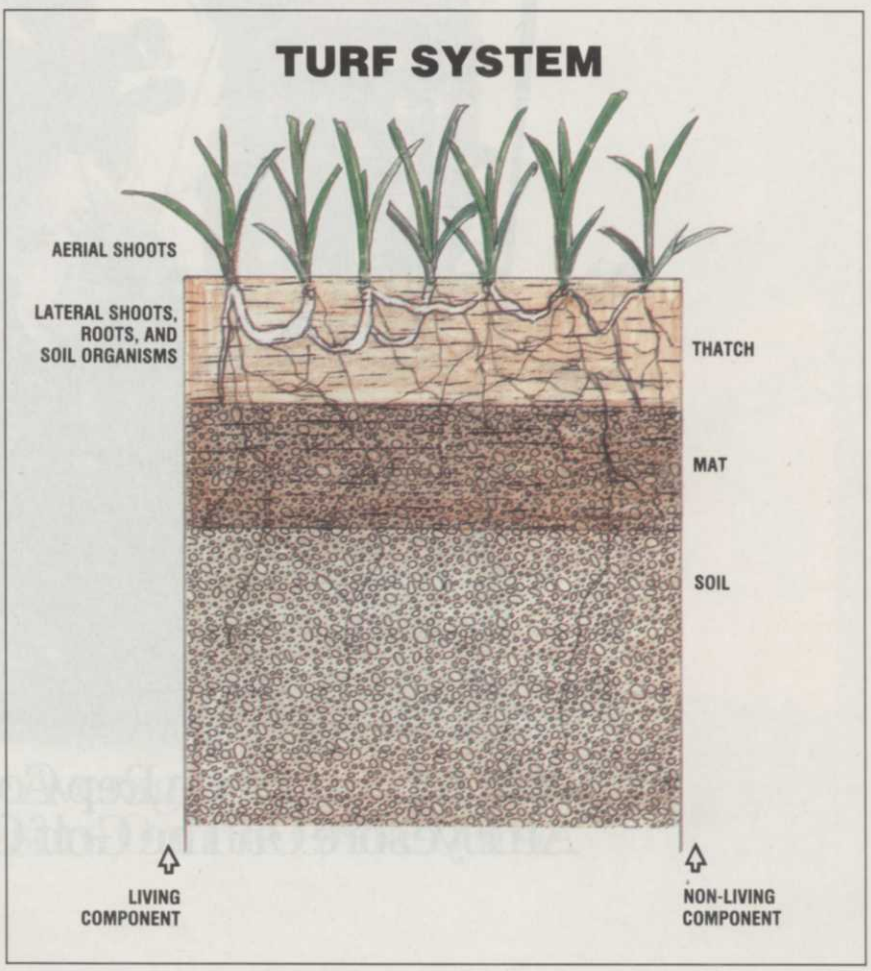
Clippings have been cited as a factor in thatch formation, so some people have advised removing clippings during mowing as a thatch-control measure. However, there is little evidence to support this observation. As a general rule, clippings decompose fairly rapidly, so they are not thought to contribute significantly to thatch formation.

If thatch is the result of an imbalance between the production and decomposition of turfgrass biomass, then any factor that either stimulates production without increasing decomposition, or suppresses decomposition without reducing production, would contribute to thatch formation. Using certain pesticides that inhibit earthworms and other decomposer organisms is a cause of thatch formation.

Thatch development has been observed in otherwise thatch-free turf following successive applications of chlordane, bandane and calcium arsenate. Earthworms were eliminated from these turfs, and various microbiological activities were suppressed.

Rapid thatch formation has also been observed on very sandy soils lacking earthworms and other macrofauna. Some extremely acid and/or highly compacted soils, also without earthworms, have been associated with substantial thatch accumulations. Thus, selecting a loamy soil with a slightly acid to neutral pH and teaming with earthworms and other beneficial organisms appears to be the best "preventive" control for thatch.

Where such soils are not available, various "curative" controls must be used. These will be discussed later.



Thatch formation

Thatch formation is not well understood. However, it probably begins with the net accumulation of turfgrass residues, originating as senescent leaves and/or stolons, at the soil surface. These residues are loosely arranged and thus do not, by definition, constitute thatch. However, they may be an important precursor to thatch (or they may simply be seasonal accumulations which will decompose or otherwise disappear).

The next probable step in thatch formation is the initial growth of turfgrass plant organs (roots, rhi-

A.J. Turgeon, Ph.D., is professor and head of the department of agronomy at Penn State University.

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zomes and stolons) in the loosely arranged medium formed from the deposition of organic residues at the soil surface. What, specifically, triggers this type of growth is unknown. The author has observed adventitious roots arising from Kentucky bluegrass that appear much like the "prop" roots of corn plants. That is, they arise from aerial shoot nodes above the soil surface. The extent to which aboveground rooting may contribute to thatch formation, if any, is unknown.

Subsequent turfgrass growth results in the elevation of crowns above the soil surface to positions well within the thatch layer. This may be due to continued development of existing crowns associated with aerial shoots, or to the formation of new crowns from emerging rhizomes or other lateral shoots.

Crowns are compressed stems with little or no internode elongation. At the top of the crown is the growing point containing leaf primordia and, at the very top, an apical meristem. New leaves arise from the lowermost primordia; new primordia arise from cell division at the apical meristem. This also contributes to further development of the crown itself, as long as its associated shoot survives.

As organic debris is deposited, the crown may be allowed to continue developing to a position well above the soil surface. Then, roots emerging from the crown develop, at least initially, in the organic layer. Rhizome tips are pushed through the soil principally by internode elongation; once the tip encounters light, internode elongation ceases and a new crown begins to form. In a thatch-free turf, this occurs near the soil surface. In a thatchy turf, however, it occurs above the soil surface and in the thatch layer.

As in the previous example, roots and lateral shoots emerging from crowns may develop, at least initially, in the organic medium. This intimate association of living and dead plant material would, in all likelihood, contribute to the organic layer's stability. The layer would also come closer to fitting the definition of thatch given earlier: it would be "tightly intermingled" because of the binding effect of living roots and other plant organs residing therein. As older shoots and roots die, the crowns, roots, and lateral shoots may eventually grow mostly in the thatch, rather than in the soil. Thus, substantial thatch can be the primary growth medium for the turfgrass community while the underlying soil is of only secondary importance.

Characteristics of thatch

Thatch typically has a lower bulk density than soil. Since the soil underlying thatch may contain few roots or rhizomes, it tends to be more compacted than thatch-free soils in which these organs grow extensively. This illustrates the favorable effects of root and rhizome growth on soil physical conditions.

The thatch layer may contain some soil. Much of the soil may have been carried by earthworms to the turfgrass surface during the spring and fall. In intensively cultured turfs, soil can also accumulate in the thatch as a result of top-dressing, core cultivation and vertical mowing.

The effects of incorporating soil into thatch include: increased bulk density, increased nutrient and water retention, reduced pesticide leaching, and accelerated decomposition of the organic residues making up the thatch.

Since thatch is typically regarded as an organic medium essentially lacking soil, including soil into the thatch results in a thatch-like derivative (sometimes called mat) with entirely different physical and chemical properties. Physically, thatch is analogous to coarse sand in that it has large pores. This property means that thatch has better aeration than most soils, as well as better resistance to compaction under traffic. However, the large pores readily lose water to the underlying soil and evapotranspiration to the atmosphere.

An additional problem is that upward water movement stops at the thatch-soil interface where capillary pore continuity is disrupted.

Importance of thatch

Because of thatch's poor water-retention capacity, and also because of restricted rooting, thatchy turfs are especially prone to wilting during long droughts. When completely dry, thatch may become hydrophobic and thus repel water. Consequently, thatchy turfs generally need more irrigation than thatch-free turfs. The frequent waterings needed to sustain thatchy turfs during hot, dry weather tend to leach nutrients and pesticides through the thatch; thus, these materials have to be applied more often than would be necessary on a thatch-free turf. This condition is worsened by thatch's low nutrient-retention capacity.

When nutrient-retention capacity is expressed as the cation-exchange capacity (CEC) in meq per 100 grams of soil/thatch, the values for thatch may be relatively high compared to most soils. This is largely due to the low bulk density (BD) of thatch, typically 0.25 grams per cubic centimeter, compared to soil bulk densities that average in excess of 1.0 g/cc.

When CEC is expressed on an undisturbed volume basis (CEC*BD), these values provide a reasonable comparison of the relative nutrient-retention capacities of different media. The CEC*BD of thatch is typically much lower than that of a loamy soil. This, coupled with the large aeration capacity of thatch, accounts for soluble nutrients rapidly leaching through the thatch layer of many turfs. Selecting slowly soluble or slow-release nitrogen formulations reduces the nitrogen leaching potential and thus increases the efficiency with which turfgrass uses this nutrient.

Another problem associated with thatchy turf fertilization occurs because soil-testing laboratories routinely discard the thatch before testing samples (if, in fact, the thatch is received with the soil). If most of the turfgrass root system is confined to the thatch layer, the value of soil-test results in determining fertilizer requirements is questionable. A valid test should include the thatch as part of the sample, and separate analyses should be conducted for the thatch and soil layers.

Pesticides applied to thatchy turf initially contact the thatch, not the soil; thus, the mobility, metabolism and action of pesticides in thatch determine the efficacy, persistence and selectivity of these chemicals. Attempts to characterize pesticide activity based on studies conducted in soil media may lead to inaccurate conclusions when applied to turfgrass systems with thatch.

Field studies conducted at the University of Illinois showed that several pre-emergence herbicides were substantially more injurious to thatchy turf than to thatch-free turf. Corresponding laboratory studies showed that these herbicides were more

A valid soil test should include the thatch as part of the sample, and separate analyses should be conducted for the thatch and soil layers.

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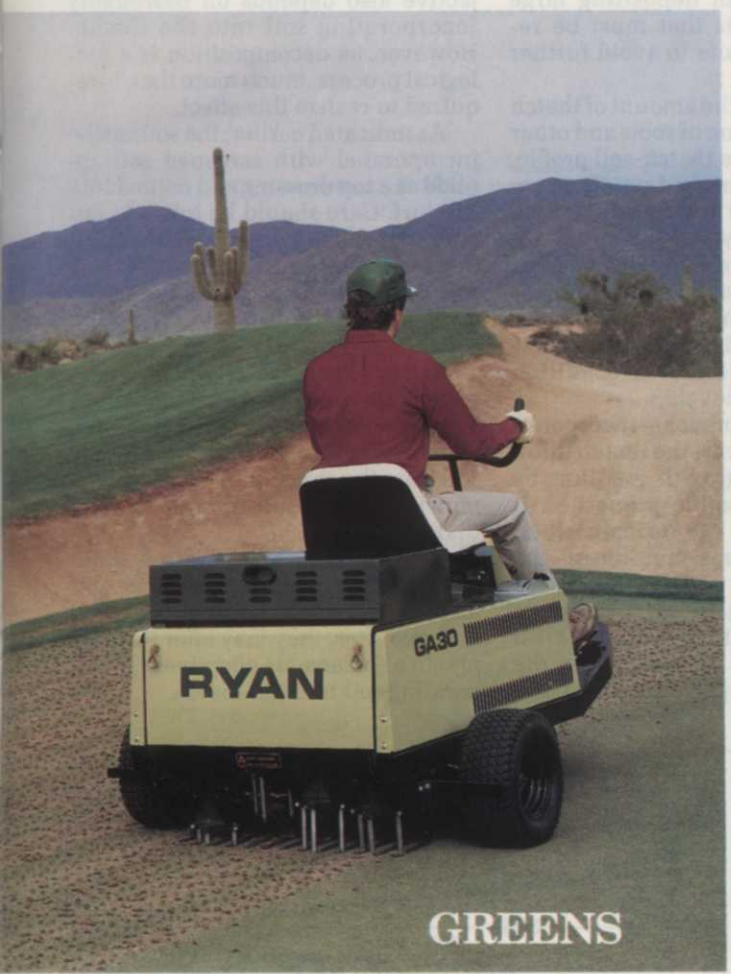

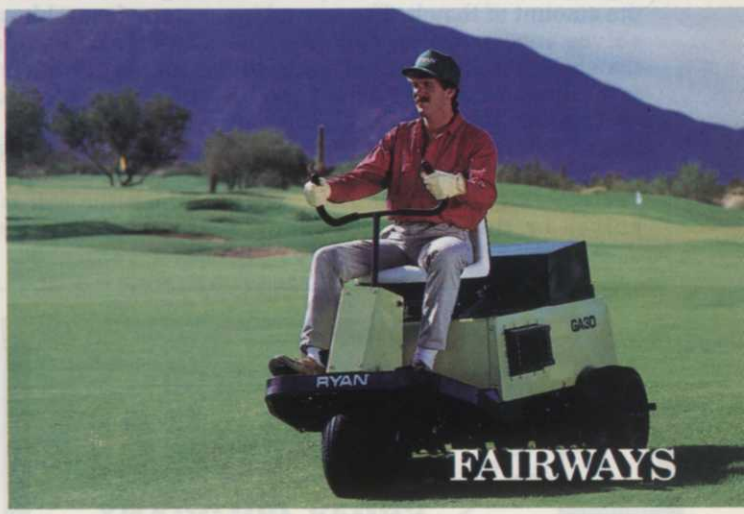

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mobile in thatch than in silt loam soil. Thus, the herbicides were allowed to contact the turfgrass roots and rhizomes in the thatch, but were held above these plant organs where they occurred in the soil in a thatch-free turf.

This work established two dimensions of potential turfgrass injury from pre-emergence herbicides: the inherent susceptibility of turfgrasses to injury from herbicides that contact their roots and rhizomes, and the accessibility of these plant organs to surface-applied herbicides due to the nature of the media containing these organs.

Control of thatch

There are two fundamental approaches to controlling thatch in turf. The first involves physically removing organic debris to directly reduce the amount of thatch. The second involves incorporating soil into the thatch either through recycling the soil contained in the turf-soil profile or through topically applying soil from a different location.

The first approach usually uses a vertical mowing machine, with knives or tines mounted along a rapidly rotating, horizontal shaft. The machine, when set to the proper depth of penetration, removes portions of the thatch. Where a substantial thatch layer exists, this procedure usually results in depositing large amounts of debris that must be removed from the site to avoid further turf damage.

Depending on the amount of thatch and the distribution of roots and other plant organs in the thatch-soil profile, this procedure can moderately to severely injure the turf. Thus, a long period of recovery and some replanting may be needed following vertical mowing to re-establish the turfgrass community. Furthermore, if the original cause of thatch development is not corrected, the thatch condition will probably re-develop.

The second approach—incorporating soil—can convert the thatch into a more favorable growth medium by modifying its edaphic properties. It can also promote the decomposition of organic residues making up the thatch.

Accomplishing the first objective depends on the thoroughness with which the soil is dispersed into the thatch layer. Depending upon the thatch layer's thickness and bulk density, some vertical mowing may be needed to reduce and/or open up the thatch layer and thus help the soil incorporation process. The second objective also depends on thoroughly incorporating soil into the thatch. However, as decomposition is a biological process, much more time is required to realize this effect.

As indicated earlier, the soil can be incorporated with screened soil applied as a top dressing and matted into the turf. Care should be taken to ensure that the top dressing soil is similar in texture to the soil underlying the turf, and that subsequent top dressings use the same or very similar soils.

A less expensive alternative is to recycle the soil from the thatchy turf. This is done by core cultivation and subsequent re-incorporation of the soil from the cores, or by deep vertical mowing to pull soil up and into the thatch layer.

Obviously, these cultivation methods will not produce results as uniform as top-dressing does; however, for large sites, they may offer the only practical means for effectively incorporating soil into the thatch. **LM**

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CORPORATE STRUCTURE: C corp vs. S corp

by Rudd McGary and Ed Wandtke

Many of you will be shocked by the impact on your personal taxation this year.

With the changes in the Tax Reform Act of 1986 and the allowance of businesses and individuals to change from the traditional corporate structure "C corp" to the alternate corporate structure "S corp," many closely-held companies changed to S corporations. That way, they could take advantage of the more favorable tax rates.

But many of those people didn't know some of the alternate consequences of that action. This knowledge will come in the form of increased taxes for 1987 and possibly even higher taxable income in 1988. Was this change in corporate structure the right move for your company?

The benefits

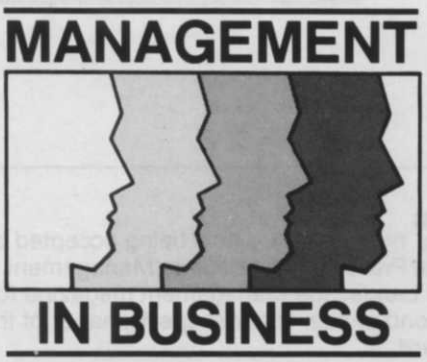
First, let's look at some of the benefits initially heard by you that led to your changing the form of the corporate structure from a C corporation to an S corporation:

1. Ability to have all income taxed at the lower personal income tax rates for individuals because of now operating under an S corp structure.

2. Avoiding the possible double tax on income passed to you in years after it was earned by the C corp.

3. Protecting your company and your personal assets from any attachment by possible creditors.

Wandtke and McGary are senior consultants with All-Green Management Associates in Columbus, Ohio. Dr. McGary focuses on marketing and managenent issues. Wandtke focuses on operations and financial questions.



4. Ability to establish more favorable retirement benefits for you as the owner of the S corp.

5. Avoid double taxation in the event you decide to sell the company.

The negatives

What are some of the potential negative aspects of switching to an S corp?

1. An S corporation cannot be acquired by a C corporation in the event of a sale of the company.

2. Pension or retirement plans that are discriminatory will be an unallowable deduction for the C corporation.

3. Transfer of the company to another set of owners will be more cumbersome in the event the current owner desires to maintain an equity position in the company when it is owned by the new operators.

4. All new S corporations will need to adopt a calendar year reporting period.

5. All new S corporations will report their financial results on the accrual accounting system.

6. Any C corporation that converted to an S corporation in 1987 because of the tax law change is prohibited from returning to the C corporation structure for five years.

7. If retention of equity in the company is required to grow the company, electing the C corp structure is more tax wise advantageous.

At first glance, the new tax law changes switching to an S corporation look favorable. But, upon closer use of the new corporate structure you may find that you will not really achieve the objectives you had in mind when you made the change.

Get answers

Get the answers to the following questions before you make your decision to switch the form of the corporation.

1. What tax rate are you personally in now and what would be your corporate rate if you were in a C corp structure?

2. Do you or other stockholders individually have an alternative minimum tax issue?

3. Do you have any inactive stockholders?

4. Would you pay dividends if the company had extra earnings?

5. Do you plan on raising capital through the issuance of shares of stock?

When should you avoid electing or switching to an S corp status?

1. If the business has losses and inactive stockholders.

2. NOL (net operating losses) cannot be transferred to or used by an S corp.

3. Fringe benefits are limited for stockholders who own more than two percent of the outstanding share of a company.

4. If the company plans on buying another company or forming a subsidiary of its own.

5. Convertible debt or preferred stock cannot be sued if a company is an S corp.

Summary

In the future, consult with your certified public account and lawyer when there are new tax changes. Lower taxes may be the desire of everyone, but if that limits the future options of the corporation, it may not be worth it.

Meet with your advisors before you undertake any change in the corporate structure of your business. Discuss your future objectives for the company and how you anticipate handling the ownership of the business.

All that sparkles is not gold; likewise, an S corporate form may not be the right form for your corporation. **LM**

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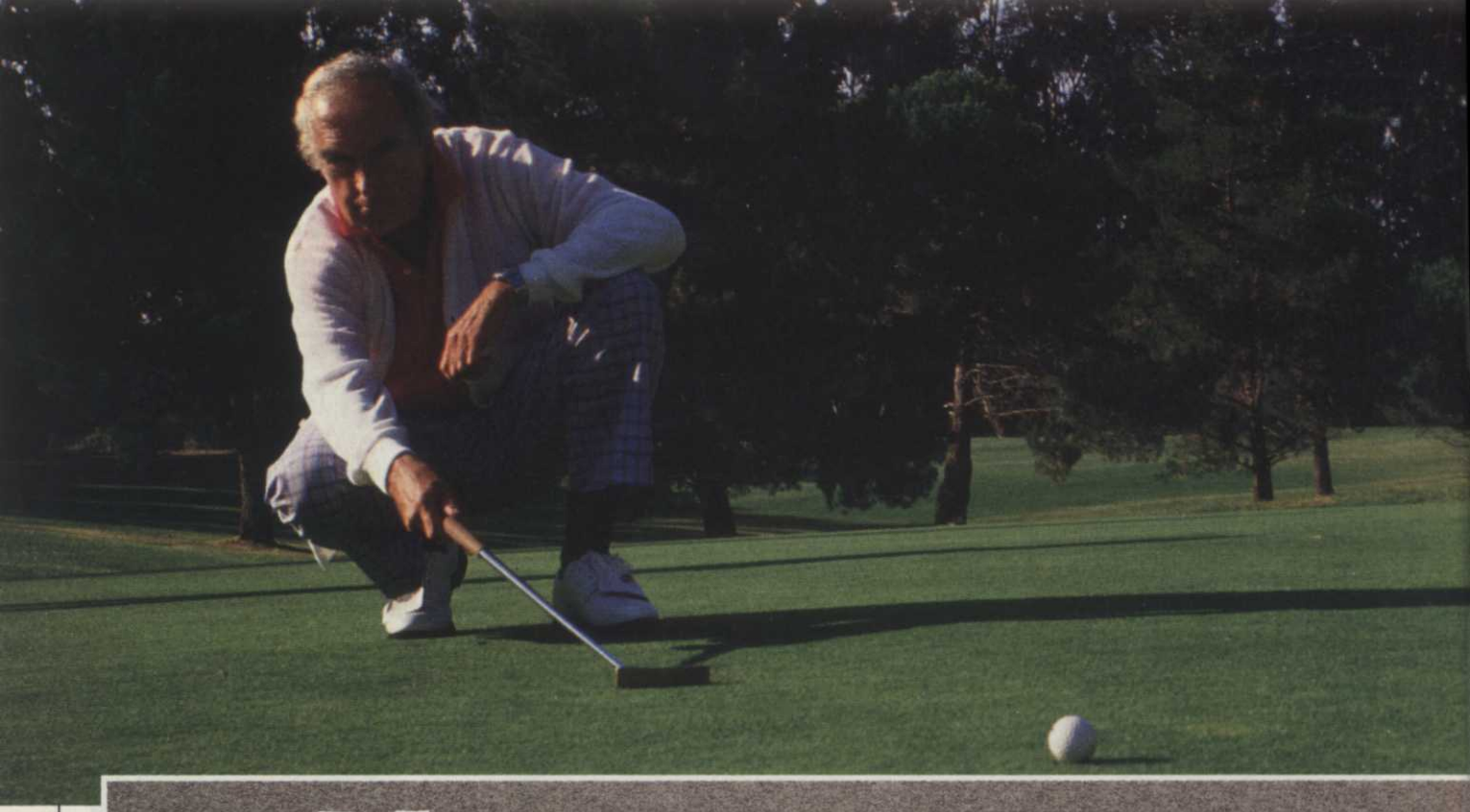

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Apply Banner at the 2-4* oz. rate (May or June through September) for 10-21 day brown patch control. And at 1-2 ozs., Banner provides excellent systemic control of anthracnose, powdery mildew, rust, red thread and stripe smut. Or, use Banner at the higher 2-4* oz. rate to achieve broader-spectrum control of leaf spot and melting out for 14-21 days. And the 4* oz. rate for summer patch and spring dead spot at 30-day intervals.

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As with all turf fungicides, Banner's scheduling is critical. But when schedules are interrupted and brown patch is present, use Banner at a 2 oz. rate in a tank mix with contact fungicides like Daconil 2787® or Chipco® 26019. The contact fungicides will control existing diseases and Banner will prevent future infections.

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A differential slip wear machine is used on a trial of turf reinforcement materials. The areas free from mud are reinforced by a molded plastic mat and a needle-punched polypropylene geotextile.

ATHLETIC FIELD DRAINAGE

The Sports Turf Research Institute in Bingley, England is far ahead of the United States in research on field construction, drainage and wear tolerance. During the last decade, researchers at STRI studied what makes a good field.

by Stephen W. Baker, Ph.D., The Sports Turf Research Institute

Britain has a problem. Many of the principal sports—notably soccer, rugby football and field hockey—are played through the winter months with the summer as off-season. Rainfall for the period of November through March, the heart of the playing season, averages about 2.2 inches per month in London and four inches per month in wetter areas in the north and west.

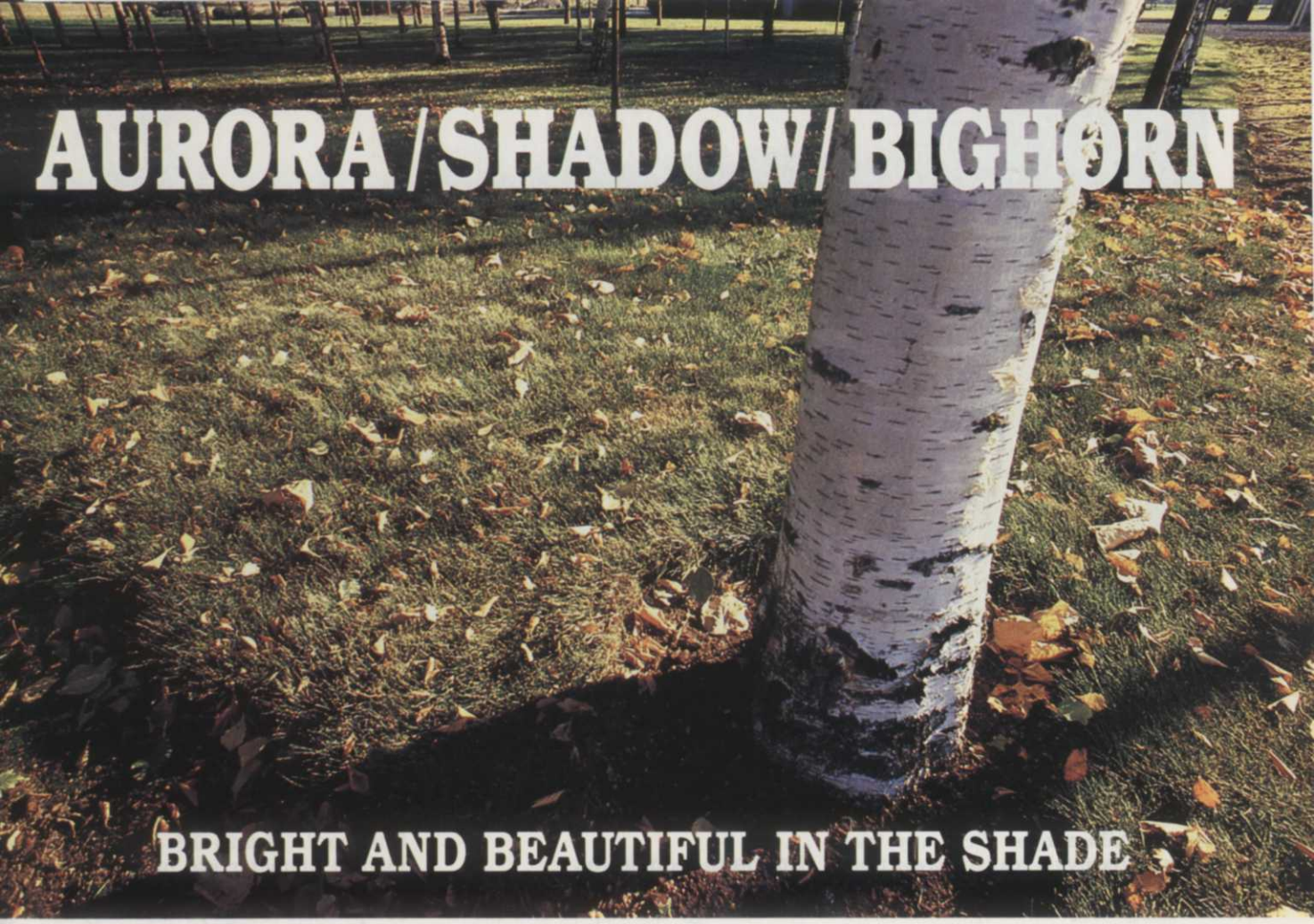
With evapotranspiration rates of less than 0.4 inches per month at this time of year, there is a considerable surplus of water. This problem was reflected in a survey of sports field drainage published by the Sports Turf Research Institute in 1983. Of pitches (fields) owned and maintained by local town and city councils, 44 percent had a drainage problem. Twenty percent of the pitches had regular match cancellations between November and February.

The alarming picture of poor drainage indicated by the survey does not, however, reflect a lack of suitable technology to create hard-wearing, well-drained sports turf in Britain. Indeed, since the 1960s, there has been a revolution in the construction methods used for winter games pitches. This is reflected in high quality natural grass sports surfaces at many of the professional soccer grounds in Britain.

Research techniques

In the last 10 years, the Sports Turf Research Insititute has had a major program of research on the drainage of winter game pitches. This includes work on fundamental drainage theory and on the management of free-draining, sand-dominated, rootzone media.

Continued on page 70



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Low growing Aurora, Shadow and even shorter growing Bighorn require less mowing, making them ideal for roadsides and other low maintenance areas.

All-in-all, when your turf area is in the shade, where water, nutrients and maintenance are costly, it'll pay you to look into Aurora, Shadow and Bighorn . . . the good look in fine fescues.

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A trial at the Sports Turf Research Institute shows the cost-effectiveness of different construction methods. The same intensity of simulated wear is applied to all plots, but those with pipe drainage are a sea of mud, while the slit-drained and sand rootzones retain a good grass cover.

The research work consists of two main philosophies. First, any trials should receive a realistic wear treatment. It is meaningless to conduct drainage research for sports turf without considering the interaction with the wear and compaction caused by play.

Mike Canaway of the STRI has developed a differential slip wear machine which is widely used in our experimental work.

For soccer, this can be fitted with studded rotors: the vertical forces are applied by virture of the machine's weight (348-480 lbs. depending on the amount of ballast) while horizontal forces occur because the front and rear rotors are coupled by pulleys of unequal size. The front rotors move faster than the overall forward speed of the machine and rear rotors slower, and this causes a tearing action on the turf.

The second important aspect of research is that the data collection should be meaningful to the sport in question, and in particular that player's needs should be considered. Factors such as ground cover and infiltration rates are monitored in most trials, but there is an increasing emphasis on surface playing quality.

For soccer, for example, tests include ball rebound and ball roll characteristics; the traction or grip properties of the surface; and the hardness for running/falling. These results can be interpreted in relation to recently-developed performance standards.

Drainage techniques

Research has been conducted on both slit drainage techniques and the effects of different rootzone materials. Slit drainage is primarily a method to by-pass the de-structured and compacted surface layers of a sports field.

If vertical slits of highly permeable

A differential wear machine is fitted with studded rotors to simulate football-type wear.

sand and gravel materials are installed on close centers, typically less than two feet to about 3.2 feet and connect into an underlying pipe drainage system, rain water can pass rapidly from the surface to the drains. There are, of course, optimum flow lengths, spacings, widths and depths of the slit drains. This has been studied in relation to design rainfall events.

Research on rootzone composition has considered both the effect of sand type and the proportion of sand that should be used. Uniform medium-fine sands of 0.25-0.5 mm (.01-.02 inches) diameter are preferred for winter games. That size satisfies the compromise of high permeability and good aeration against the problem of droughtiness and instability when wear removes much of the grass cover.

For many professional soccer clubs, sand-soil mixes are generally used because of the limited period available for grass establishment (the close season is only three months). Recommended specifications, however, require at least 90 percent sand in the final rootzone mix. When it takes longer for grass to establish, pure sand constructions are used more often.

Two main types are: 1) the suspended water table construction of 10-12 inches of rootzone sand over two inches of a coarse blinding sand and four to six gravel carpet; and 2) a sand carpet construction where the native soil is intensively drained with pipe drains at, almost 23 foot centers and gravel slits at 3.2- to 6.5-foot centers.

A layer of four to six inches of medium-fine sand is then added before the pitch is sown, usually with perennial ryegrass. This provides a free-draining surface layer, yet the grass roots can still penetrate into the soil beneath, which acts as a reserve for moisture and nutrients.

The use of sand-dominated rootzones has many management implications. In consequence, the STRI

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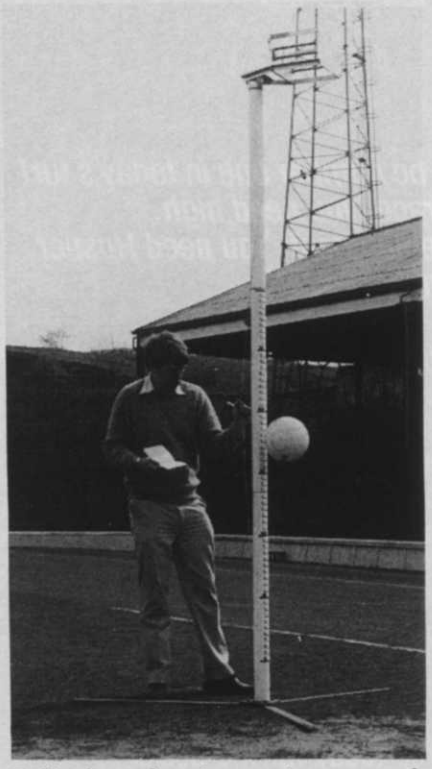


Ball rebound resistance is measured by dropping a soccer ball from 9.8 feet.

also has a program of research to examine the effects of grass establishment and nutrition on sand rootzones, mechanical treatments, amendments and conditioning materials and use of synthetic reinforcement materials which are intended to increase the wear tolerance of the natural grass surfaces and improve the playing quality.

Construction techniques

The majority of pitches in Britain either have no drainage at all or just a rudimentary pipe drainage scheme. Slit drainage is widely used for both professional sports grounds and at the local recreational level. Sand-soil mixes have been used by many of the senior professional soccer clubs, but Britain still probably has no more than 50 pure sand rootzone pitches.

Sand-based rootzones have consistently performed well in trial work. Where they have been used, the response has been generally favorable. The construction costs are, however, four to eight times that of a pipe-drained pitch and two to five times that of a pitch with slit drainage.

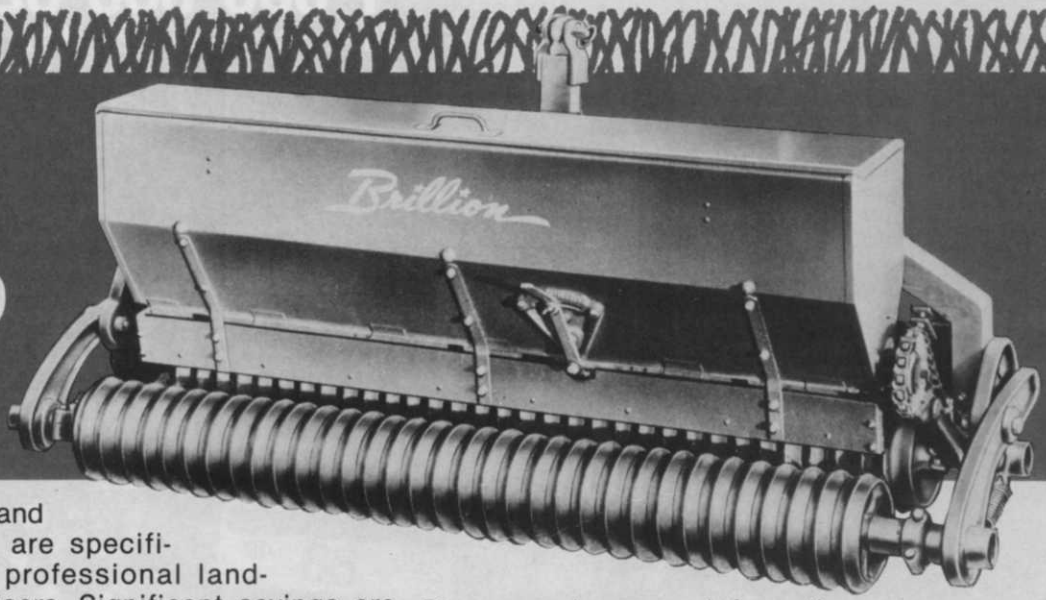
This addititional cost must be justified in terms of improved playing performance performance and in the number of games that can be held.

Measuring traction: the force to tear the studs through the grass is measured using a dial-indicating torque wrench.

Little published data is available on the relative performance of different construction types. But this is currently being investigated by a trial with simulated wear at the STRI and an extension trial using detailed pitch monitoring.

Principles of construction needed to produce high quality surfaces have been established in Britain. These two trials should give justification for much more widespread use of these drainage techniques. **LM**

Dirt Cheap Grass



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3. Our 50 and 100 gallon boom sprayers from Broyhill are fast and efficient. Use one for herbicides, one for pesticides* and the grass will always be greener.

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5. Our optional turf tires,† specially designed for the Terrapro, are even gentler on your turf.

6. Switch to our handy hand-held sprayer in tight spots.

Time saving tip: When you're not mowing or spraying, use the Terrapro to get quickly from one part of the course to another. (To prevent unseemly hot rodding by your crew, lock the dual-range transmission in low.)

Optional tip: Attach our optional Hydraulic Power Unit† to the PTO for driving aerators, post hole augers, hydraulic rakes and the like.**

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Circle No. 186 on Reader Inquiry Card

New amine-compatible iron greens up turf in less than 48 hours.

Let us send you a sample of FERROMEC® AC (amine-compatible); test it and see for yourself what a valuable tool it is in the management of turf and ornamentals.

Everett Mealman, President
PBI/Gordon Corporation

During the last several years, literally thousands of lawn care companies, landscape management contractors, and other turf professionals have been using Ferromec, and their experiences with it have been overwhelmingly favorable. The primary thing they like is the way it greens up turf virtually overnight.

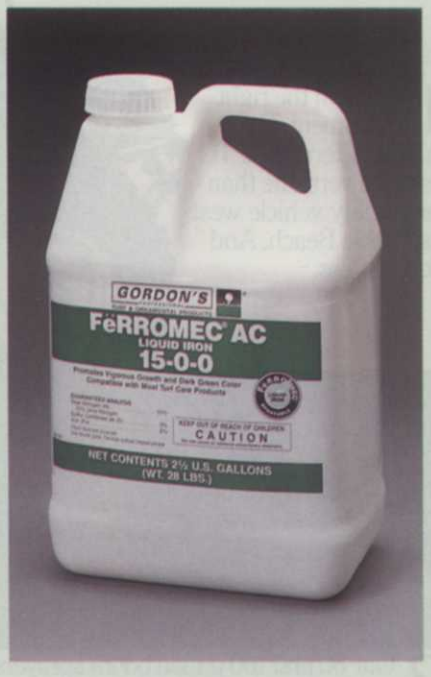
But as they have become more familiar with Ferromec, they have discovered many other reasons for liking it, along with many other places to use it besides on turf grass. Perhaps the most pleasant discovery is the fact that it increases the efficiency of herbicides, and reduces the amount of fertilizer that is normally used.

Nitrogen will eventually produce a green color, but excess nitrogen plus turfgrass equals hay. Obviously, Ferromec is a better way!

On the other hand, some lawn care companies have commented that sometimes their employees have had trouble tank mixing Ferromec with multiple components which include an amine herbicide. Obviously, in today's economy if you're a lawn care operator, you'd rather have your people spending their time spraying lawns than worrying about tank mixing instructions, so we turned the problem over to our Dr. Roger Cahoy; as usual he came up with the right solution.

Now, we can offer Ferromec AC which is absolutely amine-compatible and yet is every bit as effective as the original Ferromec.

We want to send you a sample of Ferromec AC, so you can see for yourself what a valuable asset it can be. Meanwhile you might like to review some of the facts about iron which will help you understand how Ferromec works, and why no other company can offer you a product like our patented Ferromec sprayable iron.

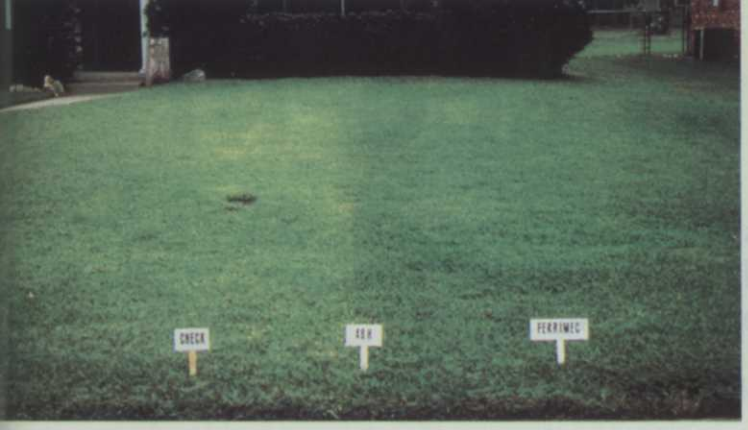


Facts about iron that turf professionals need to remember.

First: **Iron is essential for the synthesis of chlorophyl. No iron . . . no green.**

Second: **In most instances where ornamental turf is being grown there is not enough naturally occurring iron in a useable ferrous state to produce a vibrant green color. Accordingly, a chelated iron must be added to the soil.**

Third: **The only way to get the desired green color in a *relatively short time,* is to speed up the intake of iron through the roots by feeding enough nitrogen to accelerate the growth rate of the grass. This eventually will bring on the green color. But it will also bring on excessive growth which will cause unwanted mowing and exposure to disease.**



St. Augustine grass lawn in Texas showing the darker color (right) produced by Ferromec Liquid Iron applied in early September at 8 oz./1,000 sq. ft. The green-up became visible within 2 hours and the darker color persisted until dormancy, a couple of months later, according to Wallace Menn of Bryan, Texas, a turfgrass specialist who conducted the test.

Half of this green at Hodge Park Golf Course in Kansas City was sprayed with Ferromec and, within 24 hours, the color change was dramatic. Under normal growing conditions, visual response usually occurs between 8 and 48 hours after application. Ferromec is also effective on trees, shrubs and herbaceous plantings.

FeRROMEC® is totally different

Ferromec, on the other hand, works in a totally different way. Ferromec is unique. There is nothing quite like it on the market.

It is a patented process that involves bonding a ferrous iron molecule to a urea molecule. When Ferromec is sprayed on turf it is ingested almost immediately via foliar intake at the point where chlorophyl is formed. Once inside the plant, the iron-urea molecular bond breaks apart because the plant has such a ravenous appetite for nitrogen.

The result is that the iron molecule in Ferromec goes to work almost immediately to create chlorophyl and, depending on the condition of the turf and the weather, the green-up will occur any time within a range of eight to forty-eight hours.

And, of course, the green-up occurs without the excessive growth that would occur if a similar amount of iron was ingested through the roots along with the nitrogen that would be necessary to allow the iron uptake. Using Ferromec for summer turf is ideal because it reduces the amount of nitrogen you need to apply.

Special formulas for special problems

Iron is definitely established as an essential micronutrient required by all plants. Yet the amount required can vary dramatically depending on the PH of the soil and the composition of the fertilizer being used.

Furthermore, there are many situations where zinc and/or manganese are required in addition to iron. Accordingly, we have developed special formulations of Ferromec to cover such situations.

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"We put down a total of 8 ounces of Ferromec AC per 1,000 square feet when we prepared the Rose Bowl for the 1987 Super Bowl," says George Toma, noted consultant who has been responsible for preparing the fields of all the Super Bowls played to date. "We'll also use Ferromec AC for the 1988 Super Bowl in San Diego," says Toma.

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Circle No. 158 on Reader Inquiry Card

A DIFFERENT ACCENT

Use of ornamental grasses is spreading at a healthy rate across the United States. Perhaps because they're pretty close to the 'perfect ornamental.'

By Jeff Sobul, assistant editor

Remember those commercials when the announcer would come on and say, "Be the first kid on your block to have blah, blah, blah."

It's been the same for ornamental grass use during the 1980s, except that the people who sell the grasses aren't trying to sell you a "neat, faddy" piece of junk.

They are trying to sell you a different concept in landscape design. And people who use the grasses rave about them.

One advantage is, after the first month or so, the grasses essentially take care of themselves if you have the proper plant in the proper place. "Their adaptability is clear across the United States," says Michael Hurdzan, Ph.D., a golf course architect with Kidwell & Hurdzan, Columbus, Ohio.

So where have they been all your life? Probably right in your own backyard, or along the highway.

"The problem was that people didn't take the time to learn about them," Hurdzan says. Hurdzan and Richard Hurley, Ph.D., research director for Lofts Seed, are doing much toward correcting that with presentations at turf conferences.

"They are plants that are found in the wild," says Hurley, who did graduate research work on ornamental grasses at Rutgers. In 1979, he started pushing the idea of using them in the landscape. "Their only limit is your imagination," he says.

A wide variety

"In Europe, ornamental grass use is a matter of fact," says Kurt Bluemel, the largest supplier of ornamental grasses in the country. (Bluemel's Fallston, Md. facility has more than 500 species.) It took Europe a few years to accept them, but Bluemel says he has European garden magazines from the 1920s which show their use as common.

When Bluemel came to the U.S. from Switzerland in 1960, ornamentals were nearly unheard of. But he began growing and selling them, as did another Maryland nurseryman, Richard Simon of Bluemount Nurseries in Monkton.

Sales of ornamental grasses have skyrocketed the last five to seven years.

"Our grass sales are increasing at a strong rate over the last few years," Simon says; he estimates nearly 100 percent yearly increases.

Ornamental grasses look great around water. Here, giant reed grass (next to diving board) flanked by switch grass and cord grass (foreground) are used.

Pampas grass and giant reed grass are used to shield a green from the cart path at Hillcrest Country Club.

Most of Simon's sales have been to landscape contractors, "which means that they're being specified by landscape architects," he says.

Hurdzan specifies them at ever-increasing rates. "They're easy to use," he says. Just dig the appropriate size hole, add organic material for nutrition, water sufficiently for four to six weeks. The only other maintenance is cutting them down once a year in winter or early spring, depending on the variety, to six or eight inches above ground. Sometimes, every seven to 10 years, it is necessary to split them and move some of the plant if it is spreading too wide. They have also proven to be almost completely disease- and insect-free.

Hurdzan has used ornamental grasses about everywhere on the golf course: rough areas, non-play areas and even in play. Some seem to do better the worse the conditions get—bad soils, landfills, strip mines, under hotter and drier conditions.

John Moorman, superintendent at the nine-hole Hillcrest Country Club in Batesville, Ind., was one of the first people to experiment with Hurdzan's suggestions for ornamental grasses, beginning in 1981.

"We had no idea what we were getting into," Moorman says. "We were kind of hesitant. We were surprised the greens committee even let us do it, not knowing what we were getting into."

What they got into was something that became quite successful—so successful that the new course logo is an ornamental grass.

Maiden grass, giant reed grass, fountain grass and zebra grass are common on the course, used as accent plants or screens and even as a hazard on one short par four.

Hillcrest is in the process of building the second nine, and Hurdzan is frequently incorporating ornamental grasses in the holes' design.

Ornamental grasses are not very exciting-looking when they are planted, which is best done in the spring in colder climes. They are nothing more than a few short, dead-looking stalks sticking out of the ground, and some early criticism might have to be endured. But once they start shooting, look out.

"By the fall, the same members who were complaining in the spring wanted to know where to buy them for their lawns," Moorman smiles.

Moorman got his grasses from Rich Simon. "They have a lot of attributes," Simon notes. "To say why we should not use (ornamental) grasses, I can't give any reason." He emphasizes that understanding the grasses and their characteristics is paramount to

John Moorman uses Maiden grass extensively at Hillcrest Country Club. The plant often grows to six feet.

using them properly. (He and other nurserys can help potential users with this.)

Greg Kane of Lake County Nursery in Perry, Ohio, says, "People selling them have to be familiar with the grasses or they can't sell them. As we became more familiar with them, we started picking up more each year."

In general, most of the higher-growing varieties require full sunlight, with the lower ones sometimes tolerating partial shade.

Ornamental grasses are used more in the South, but they are spreading rapidly northward. "Creative designers are looking at what's done with them in the South and doing it in the North," says Bill Hendricks of Klyn Nursery, also in Perry, Ohio.

Hendricks was the first to bring ornamental grasses to northeast Ohio, in the '60s, when he was running Lake County Nursery. He found them easy to grow in the nursery and also in the landscape.

Blossoms

Ornamental grasses, Hendricks says, are very cost-efficient because of their low maintenance and resiliency. Proper site planting reduces mowing expenses and labor requirements, fer-

ORNAMENTAL GRASSES

The following is a short list of some common species of ornamental grasses and their characteristics. For a complete list in your area, contact a local nursery which grows them. (Zones refer to USDA map below.)

Giant reed grass (*Arundo donax*) grows to 14 feet; blooms mid-September to early winter; for accent or specimen plant; zones 5-6.

Plume grass (*Erianthus ravennae*) grows to 14 feet; blooms mid-August through late fall; accent or specimen plant; zone 5.

Maiden grass (*Miscansus sinensis Gracillema*) grows to three to six feet; blooms early September through early winter; fine texture, reddish pink flowers; zone 5.

Striped eulalia grass (*S. variegata*) grows to three to six feet; blooms mid-September to early winter; use as specimen, in groups or as screen; zone 5.

Zebra grass (*S. zebrina*) grows to three to six feet; blooms mid-September to early winter; unique green foliage with horizontal yellow bands; zone 5.

Switch grass (*Panicum virgatum*) grows to four to seven feet; blooms August through early winter; narrow leaf and stem, open flower head; zone 5.

Fountain grass (*Pennisetum alopecuroides*) grows to four feet; blooms late August to early fall; mounded form with feathery plume; zone 5.

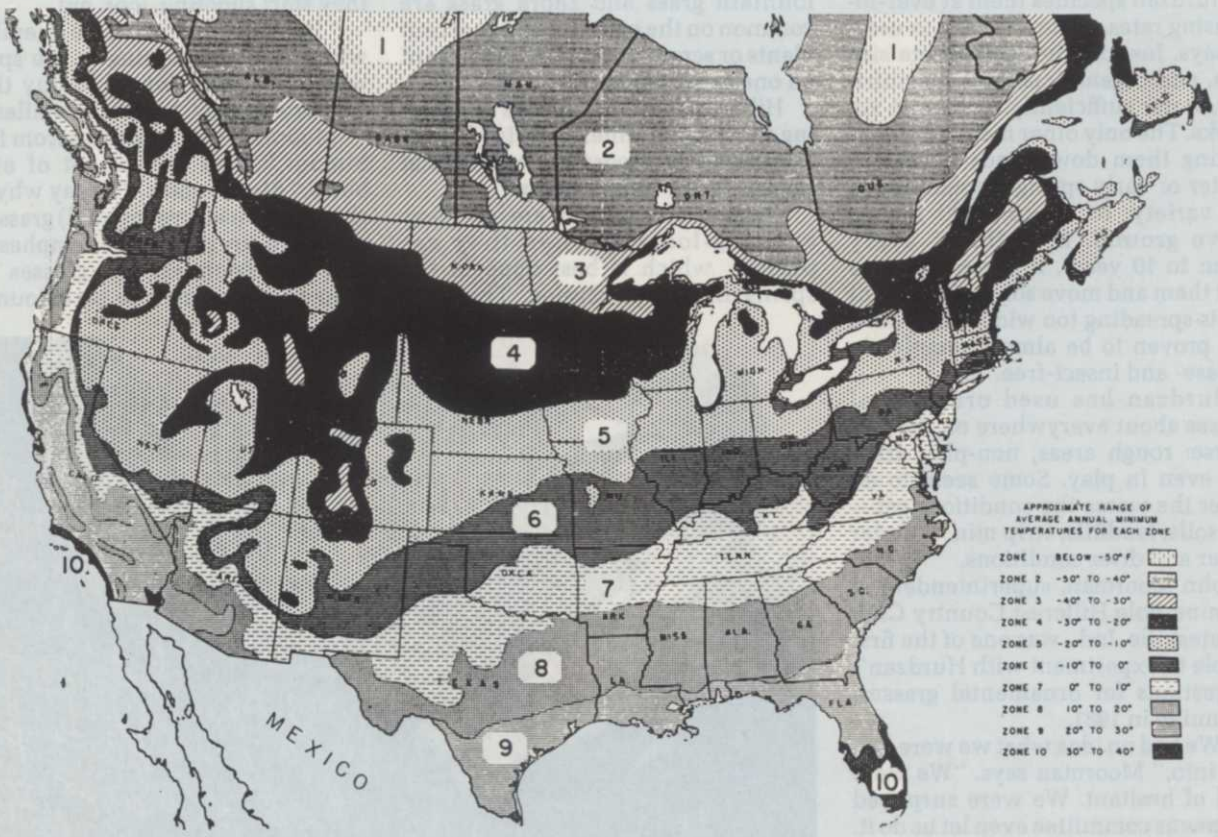
Dwarf fountain grass (*A. hameln*) dwarf version growing to one to two feet; also mounded form; zone 5.

Ribbon grass (*Phalaris arundinacea Picta*) grows to two feet; multi-striped green and white blades; zone 4.

Cord grass (*Spartina michauxiana Aureo-marginata*) grows to four feet; blooms September to early winter; shiny green foliage with yellow marginal stripes.

April green fescue (*Festuca amethystina*) grows to 10 inches; blooms in June with purple flower spikes; use as accent, border or mass plantings; zone 4.

Ruby grass (*Rhynchelytrum roseum*) grows to two to four feet; blooms late July to early October; flowers ruby red fading to pink or white; zones 5-9.



Map. The zones of plant hardiness (from *Plant Hardiness Zone Map*, Agricultural Research Service, U. S. D. A., Mis. Pub. No. 814, Gov. Print. Off., Wash. D.C.)

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Pennant was also found to maintain its excellent turf color and quality late into the season. Pennant will impress you with its rich, moderately dark green color, its fine leaf blades and its improved mowing properties.

When your reputation counts on the turf you grow . . . the obvious choice is Pennant.

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tilizer and chemical costs as well.

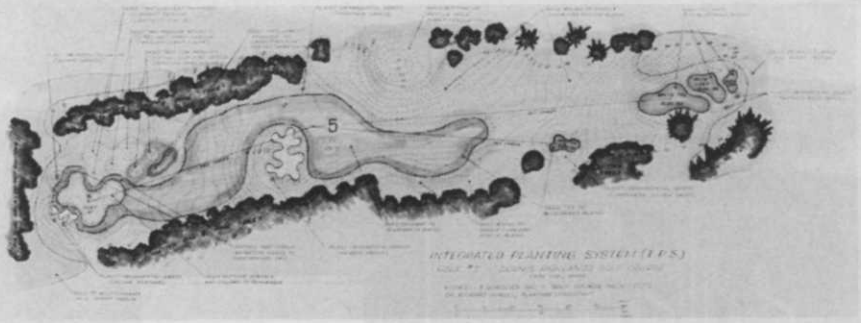
They are also attractive. Varieties show some kind of visual interest, in some cases, for nine months out of the year because of their extended blooming period. The *Miscanthus* genus displays such lengthy bloom characteristics (see box).

One of Hendricks' more recent customers, Joseph Baidy of Acacia Country Club in Lyndhurst, Ohio, began planting the grasses about two years ago.

"Using the proper setting will complement any planting on the course," he says. "You can replace trees with them and have less damage from the roots because they are fibrous."

There is a caution, though. They are grasses, he emphasizes, "and you can wipe them out if you're not careful with chemical applications."

Baidy echoes Moorman's feelings: "It's remarkable the impact they've had. The reduction in maintenance is great."



Michael Hurdzan's design specifies where plume grass, maiden grass, fountain grass and various feather grasses will be planted on the par-four fifth hole at Dennis Highlands Golf Course on Cape Cod.

Superintendent John Moorman began planting ornamental grasses on a limited basis in 1981. Now, every hole at Hillcrest Country Club has grasses on them.

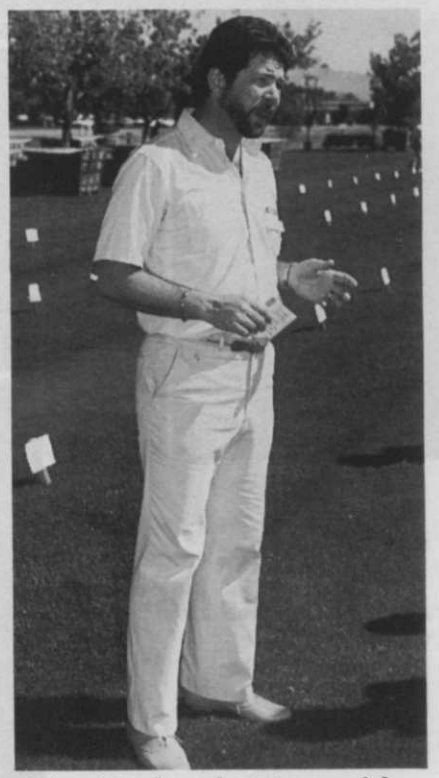
Propagation

The grasses are ideal for hillsides where mowers can't go and areas too dangerous for workers.

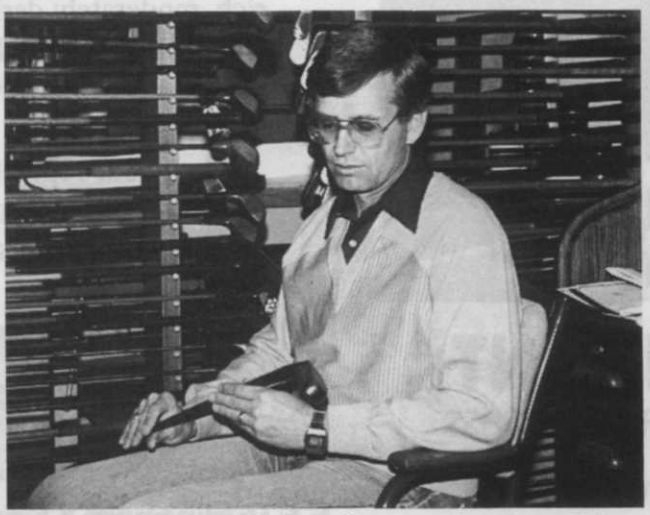
Their only drawback? There exists a wide-spread lack of education about their longer-term growth habits. Bluemel says he has grasses that he planted in his home landscape nearly 30 years ago and they're doing fine.

But first-time buyers rarely are willing to dive in and use ornamental grasses, or anything else "new" for that matter, extensively. More commonly, as in Moorman's case, they start with a few varieties and experiment. And then they expand their use.

Use of ornamental grasses in parks and zoos is widespread. Simon believes golf courses have tremendous potential as well, and would like to see more of them on the links. "The space in use now is a drop in the bucket compared to the space available," he notes. Referring to Hillcrest's second nine, he adds, "you can plant a lot of grasses on a nine-hole golf course." **LM**

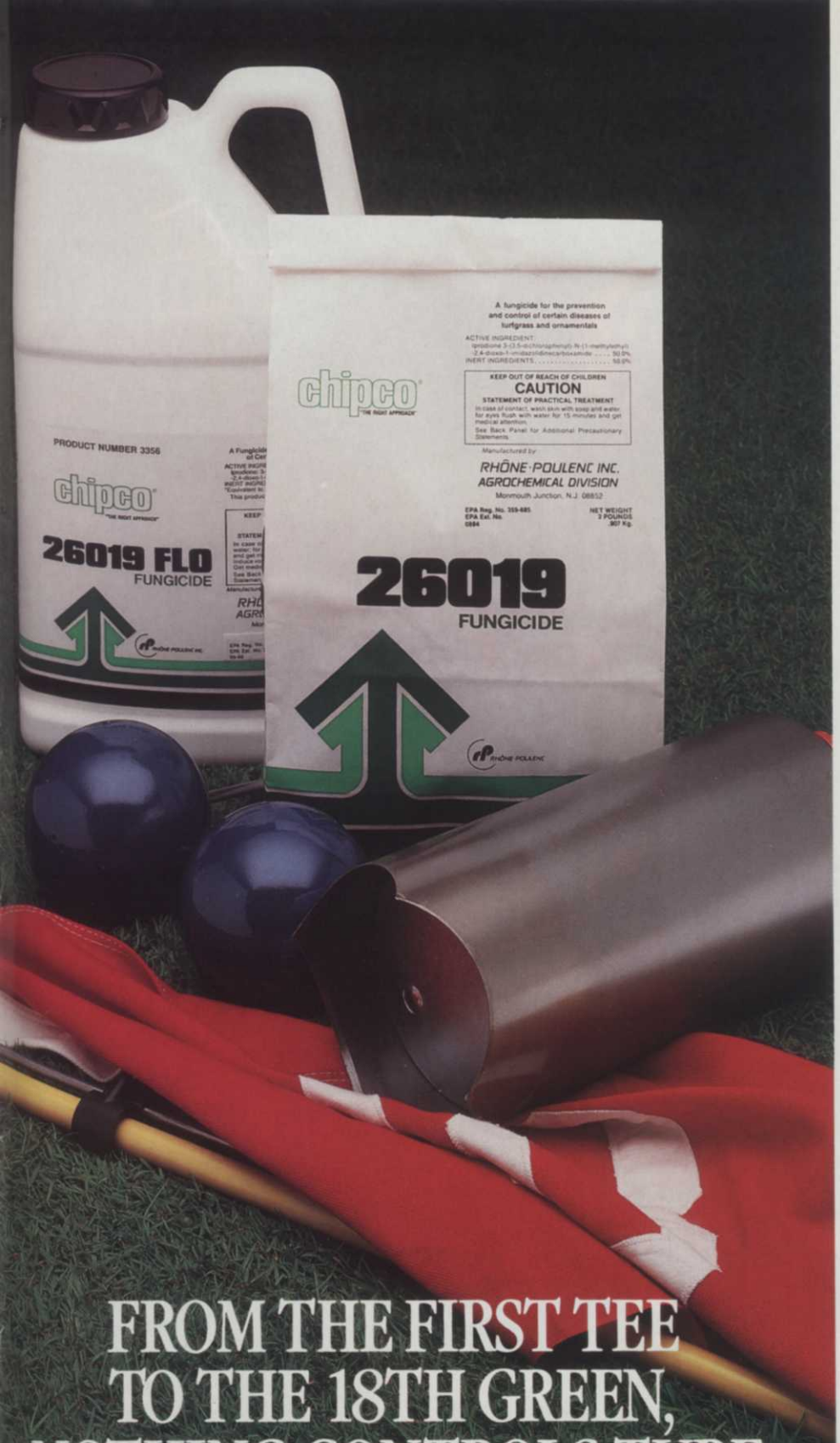


Richard Hurley, Ph.D., is one of the few people who has done research on ornamental grasses.



Though a golf memorabilia collector and student of the game's past, Michael Hurdzan, Ph.D., is an innovator when it comes to incorporating ornamental grasses into golf course design.

For Joseph Baidy of Acacia Country Club, ornamental grasses have been anything but dogs. Hannibal agrees.



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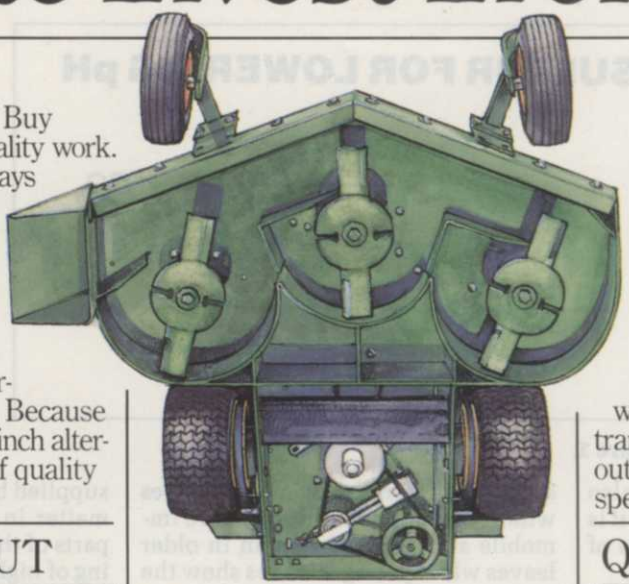

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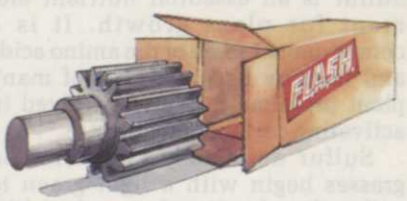

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THE USE OF SULFUR IN TURFGRASS MANAGEMENT

by Nick Christians, Ph.D., Iowa State University

The amount of sulfur (S) used on turfgrass in the United States appears to have increased considerably in the past five years. This is particularly true on golf courses, but S use also seems to be on the rise on other types of turf areas.

This is fine, providing the S is needed. However, I have recently observed a number of courses where S is being used where it is not needed or where its use is impractical. There are also cases where its use is justified, but it is applied in quantities far in excess of what is required for plant growth.

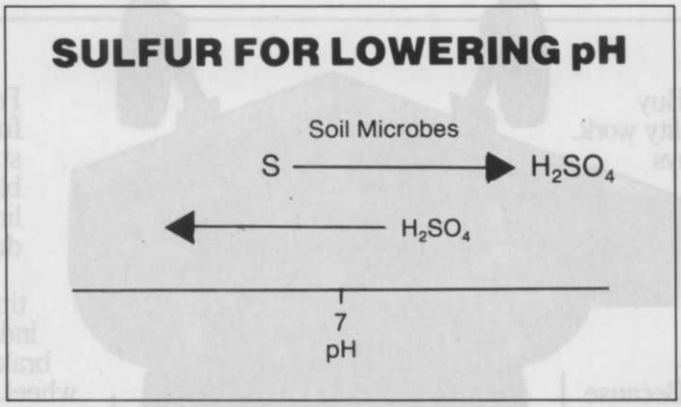

Figure 1.

Elemental S is generally used for three purposes in the turfgrass industry. It is a fertilizer, it can be used as a soil acidifying agent, and it is used in the golf course industry to reduce annual bluegrass (*Poa annua*) infestation.

Sulfur as a fertilizer

Sulfur is an essential nutrient element for plant growth. It is a constituent of some of the amino acids and thereby becomes part of many plant proteins. It is also involved in activating certain enzymes.

Sulfur deficiency symptoms on grasses begin with a light green to yellow discoloration that can look like nitrogen (N) deficiency. The problem usually becomes apparent when N is applied to overcome the deficiency, and the yellowing intensifies rather than disappears. A close examination of S-deficient plants will usually show the symptoms are worse on newly-emerging leaves and that older leaves are greener.

The chlorosis (yellowing) typical of N deficiency will usually be more intense on older leaves and younger leaves will be greener. This is due to differences in mobility of S and N within the plant.

Nitrogen moves readily through the plant and newly-emerging leaves are given preference over older leaves when N is limited. Sulfur is more immobile and tends to remain in older leaves while younger leaves show the symptoms.

The veins of S-deficient plants are generally yellower than the rest of the plant; however, this is not as easy to see on grasses as it is in plants with larger leaves. Other S deficiency symptoms include slow growth and delayed maturity, but the yellowing will be the most readily visible symptom on the grass plants.

Sulfur deficiency symptoms do occur on turf, but they are rare throughout much of the United States. The reason for this is that S is released into the atmosphere by the burning of high-sulfur coal and is returned to the soil by precipitation. In most parts of the country, this S is sufficient for plant growth. Places exist in the East and Northeast where rain is acidified by the S to such an extent that plants can be damaged by the resulting "acid rain."

Sulfur is also released from the breakdown of organic matter in the soil, and this can be a significant source of S in many areas. The literature is inconsistent as to the S needs of turfgrasses, which would be expected given the diversity of conditions under which turf is managed and the variety of management practices used in its care.

A reasonable estimate for most turfgrasses would be in the range of 8-20 lbs. S/acre/yr. Intensely managed turf grown on sandy soils, with the clippings removed, would require S rates at the high end of the scale.

Notice these figures are in lbs./acre not lbs./1000 sq. ft. Ten lbs. S/acre is the equivalent of 3.7 oz. S/1000 sq. ft., yet it is not unusual for turfgrass managers to apply S at a rate of several pounds/1000 sq. ft.

Remember too that some of this needed S is supplied by the breakdown of organic matter in the soil and that in many parts of the country, S from the burning of high-S coal falls with precipitation. In Iowa, 12 to 15 lbs. S/acre/yr. is derived from precipitation. This combined with the S released from organic matter breakdown supplies more than enough S for plant growth and no S-deficient areas have been identified in the state.

This is true in most states with the exception of those whose precipitation comes from regions where high-S coal is not burned and little S falls in precipitation. These areas include the West Coast states, parts of Florida, and some of the far northern regions of the U.S.

In some geographic areas in the Central U.S., such as the Sand Hills of Nebraska, S deficiencies are found. But in most of the country, S is readily available and no more needs to be applied for the proper management of turf. Information on S needs in a particular area should be available from the local extension service.

If an S deficiency is suspected, soil tests are available to determine if it's needed. However, the simplest way to test for S deficiency is to establish a small test area with an untreated control to prove that there is some benefit from the applied S. *Never indiscriminately treat the entire area until it is certain the application is needed.*

Sulfur as an acidifier

A soil pH in the range of six to seven

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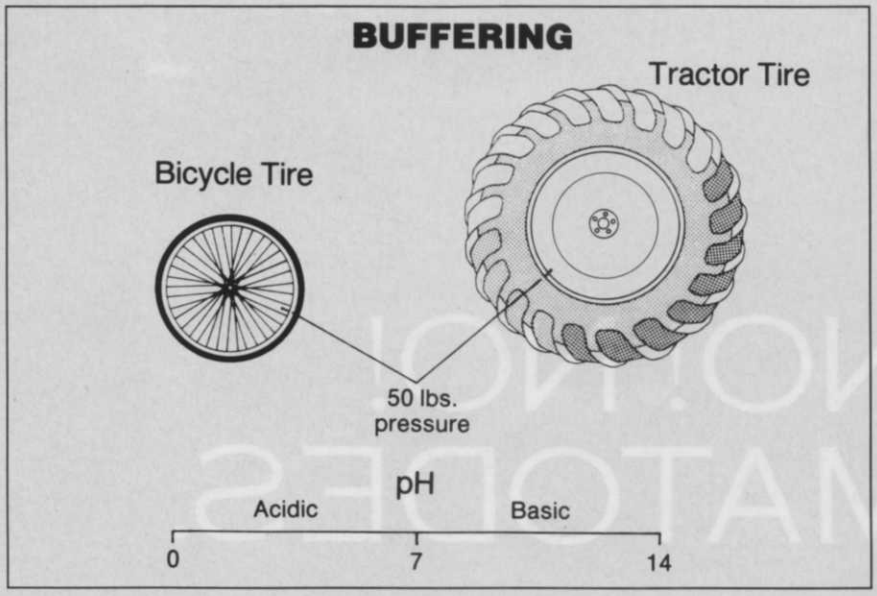

Figure 2.

provides the best chemical environment for the growth of grasses. When pH values fall outside of this range, there are potential problems with nutrient availability and there may be detrimental shifts on microbial populations. If the pH is excessively low, the soil can be limed and the pH raised to the proper level.

Reliable tests are available to determine how much lime is needed in a given situation, and the process of raising pH is relatively easy and inexpensive on most soils. Often the problem is not one of an excessively low pH, but one of excessively high pH. Turfgrass managers throughout the country find pH values of 7.5 to 8.3 (or even higher on the sodic soils of the West) to be common.

The lowering of soil pH (acidification) is generally not as easy as raising pH. Sulfur is the material usually recommended for acidification.

Theoretically, this is a sound practice.

Sulfur applied to the soil is converted to sulfuric acid by soil microbes which lowers pH (Fig. 1). The problem is that in many soils the amount of S required to lower pH is so large that the process is impractical.

The problem soils are the calcareous soils, those that contain lime (calcium carbonate). This is the same lime used to raise the pH of acidic soils. In many soils, calcium carbonate ($CaCO_3$) is a part of the parent material from which the soil was formed.

Sand-based golf course greens are often formed of sands that contain large amounts of calcium carbonate. Greens containing 5-20 percent $CaCO_3$ are not unusual. I have personally tested soil from greens in Ohio that contained up to 40 percent calcium carbonate.

Soil scientists have found that as long as solid lime is present in the soil, it is not possible to decrease the pH. Remember that statement, because it is the key to the decision on whether the use of S will be practical for the lowering of pH.

When S is added to a calcareous soil, sulfuric acid is formed and some of the $CaCO_3$ dissolves, but as long as $CaCO_3$ remains in the soil the pH cannot be permanently lowered. This resistance to change in pH is known as "buffering." It is very difficult to change the pH of a highly buffered soil, whereas the pH of a soil with a lower buffering capacity can be changed more easily.

An analogy used by soil scientists to explain this phenomenon is to compare pH testing to pressure testing of tires (Fig. 2). Both a bicycle tire and a tractor tire could be measured at 50 lbs. of pressure. When air is released for 10 seconds from both tires, the bicycle tires' pressure will drop several pounds, but the tractor tire will remain very close to 50 lbs. of pressure. The tractor tire is "buffered" against pressure change, but the bicycle tire is not.

The pH of soils is similar. Two soils may both have a pH of 7.5. One may be readily decreased to pH 7.0 by the addition of S, whereas the other, a highly buffered soil with large amounts of $CaCO_3$, could be treated with large amounts of S and show little decrease in pH.

Recently, agronomists at Iowa State University calculated how much sulfuric acid would be required to dissolve $CaCO_3$ in the soil. They determined that if sulfuric acid costing $1.45 per pound were to be added to a calcareous soil, 68 tons of acid per acre at a cost of $198,000 would be required to dissolve just one percent of $CaCO_3$ in the upper seven inches of soil.

Many turfgrass areas, particularly sand greens, can contain many times this amount of $CaCO_3$. Consider a green that contains 20 percent $CaCO_3$ in the upper seven inches of the root zone. This green would contain approximately 10,000 lbs. of $CaCO_3$ /1000 sq. ft.

Elemental S can be applied to a bentgrass green at a rate of about 10 lbs. S/1000 sq. ft./yr. Higher rates will usually damage bentgrass.

Many assumptions can be made in calculating how much sulfuric acid will be formed when S is applied to the acid and an exact calculation of how much S would have to applied to neutralize the $CaCO_3$ and to eventually reduce pH are not possible. However, a good estimate would be that 1000-1500 years would be required to dissolve the $CaCO_3$ in this green. It is impossible to lower the pH of this area permanently and the use of S in a situation like this is highly impractical.

Temporary decreases in pH in highly buffered soils treated with S are not unusual. However, the detrimental effects of excess S on the turf usually outweigh any benefit from the slight pH decrease.

Another good analogy to explain this phenomenon of temporary pH decrease is that of a coffee pot with a glass stem along its side to show the coffee level in the tank (Fig. 3). When coffee is released, the level in the glass stem drops sharply, but as soon as the flow is stopped it quickly returns to the level in the tank.

Likewise, a highly buffered soil will show a temporary drop in pH when S is applied, but will quickly return to the higher, buffered pH when S applications are stopped.

Situations exist in which the use of S to lower pH may be practical. A soil with pH normally in the range of 6.9 to 7.0 that has been raised by the application of irrigation water high in calcium to a moderately high pH of 7.3 to 7.4, could potentially be lowered by S. However, in most of the cases where S is being applied, the soil is so highly buffered that S has little lasting effect on pH.

To determine if S should be used, start with a pH test. If the pH is 7.0 or below, S is not needed for pH modification. If the pH is high (7.3 to 8.3), lowering the pH may be desirable, but

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is it practical? (Calcium carbonate precipitates in soil at a pH of 8.25 and soil pHs in the range of 8.2 to 8.3 are a good indication that excessive $CaCO_3$ may be present).

There is a test to measure the $CaCO_3$ content of the soil, although it is not a common test performed by soil testing laboratories. Check with the local extension office concerning the availability of $CaCO_3$ tests.

In Iowa, the $CaCO_3$ test is available through the Department of Horticulture, Iowa State University, Ames, IA 50011. A private lab in the Midwest that will perform the test is A&L Great Lakes Agriculture Laboratory, Inc., 5011 Decatur Road, Fort Wayne, IN 46806, and there are likely others throughout the country. If the soil contains free $CaCO_3$, trying to lower its pH with S is not advised.

The main concern when the pH is high is that some plant essential nutrients will not be available for uptake by the root system. Rather than trying to lower pH in these calcareous soils, a better approach may be to apply micro-nutrients to the foliage in the liquid form. This approach will not always be practical either, but on high-maintenance areas such as golf

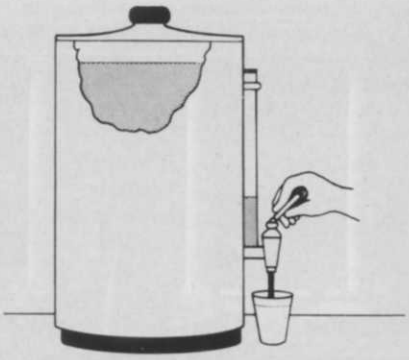

Figure 3.

course greens it would be preferable to trying to lower pH with S.

Sulfur for poa reduction

Poa annua is one of the most troublesome weed problems on golf courses. No completely effective herbicide has been found to control it. In the early 1970s, research was conducted in Washington state that indicated S could reduce the *Poa annua* population in turf areas. The observations were accurate, but they applied to only one type of *Poa annua* at one location. The use of S for this purpose has been widely adopted in many parts of the country with mixed results.

Some superintendents report excellent control, whereas others report no reduction of *Poa annua*.

The best approach if S applications are being considered for this purpose is to try it on a limited test area first. It may work, and it may not, but before spending a significant part of the budget on S, be sure its use is going to be effective.

Summary

A sound recommendation for the use of S on turfgrass areas can be simply summarized as follows:

1. **If S is needed, use it.**
2. **If it is not needed, don't use it.**

In certain situations its use is quite appropriate, but S is also being used in many situations where it is either not needed or its use is impractical. Knowing the difference is an important part of professional turfgrass management. **LM**

Acknowledgment: The author would like to acknowledge Jane Lenahan for preparation of figures 2 and 3.

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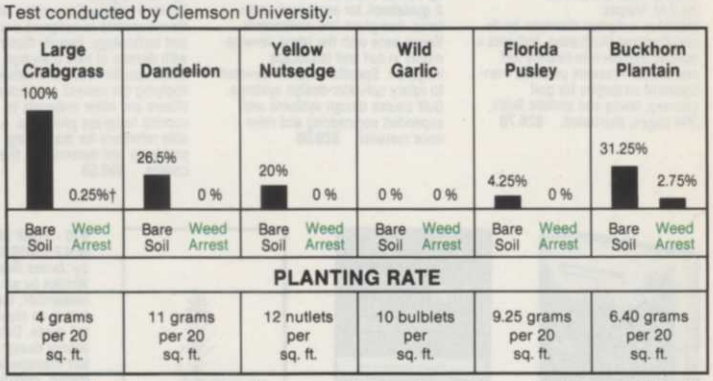
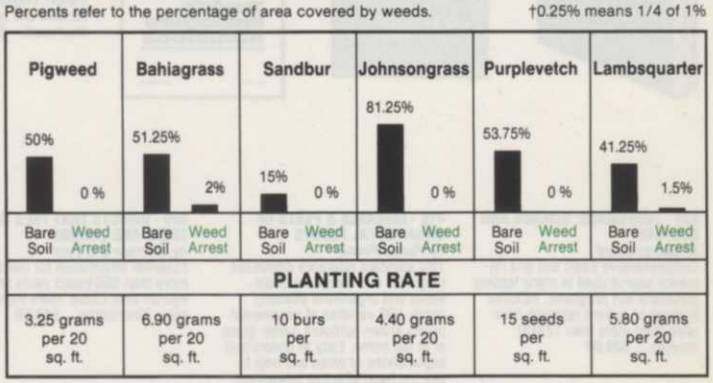


Percents refer to the percentage of area covered by weeds. †0.25% means 1/4 of 1%



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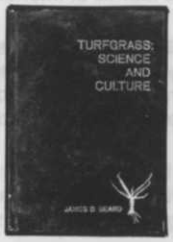

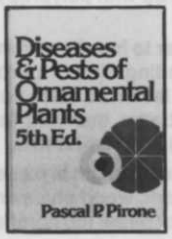

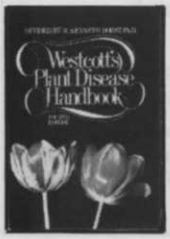

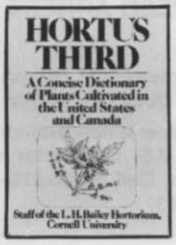

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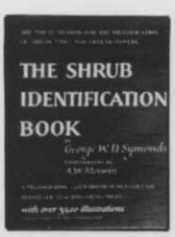

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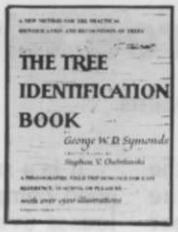

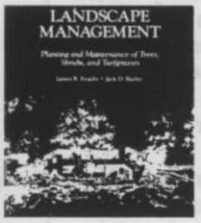

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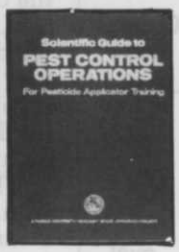

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Oak: Shade tree with character

by Douglas Chapman, Dow Gardens

Quercus—a genera with one of the greatest geographic ranges—is the most important hardwood timber group in the United States. It should be one of the most important shade tree genera in production.

Many of the individual species—such as red oak, scarlet oak and white oak—have native ranges from southern Ontario to Texas with many provenances and morphological variation. When considering optimal growing, oak species are adapted to conditions varying from droughty upland sites to flood plains. Quercus species are variably tolerant of urban stress, air pollutants (ozone and sulfur dioxide), salt and various diseases.

The oak is botanically "accepted" in two groups—white and red oaks.

A few in the white oak group include white oak *(Quercus alba)*, swamp white oak *(Quercus bicolor)* and bur oak *(Quercus macrocarpa)*. This group exhibits resistance to oak wilt, being adapted to a wide-range of sites. Generally, the lobes in the leaves are obtuse, or oval, for the entire group.

White oak

White oak is a long-lived climax forest tree (800 years). It is native to an extensive geographic range, which includes all areas east of the Great Plains. The plant is valuable for its lumber as well as an exciting landscape specimen.

It is a rapid tyloses former, thus a good compartmentalizer which callouses over quickly. The leaves are bluish-green throughout the summer, varying from a rich burgundy to a brown in fall.

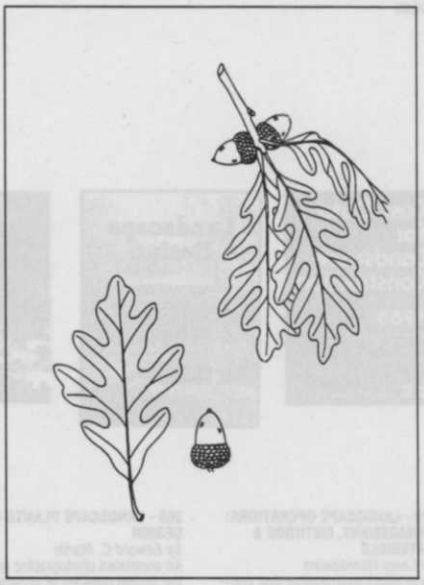
White oak transplants easily when young (under 1½ inches in diameter) into fertile, well-drained soils. When considering growing from seedlings, it is particularly important that nurserymen select seed from local sources as provenance.

Flooding, even for a short period of time, can cause root death and/or decline. The Morton Arboretum reported general decline of white oak throughout the Chicago area due to extremely wet periods early in the 1970s.

Research at the University of Illinois noted that white oak has a very shallow fibrous root system which does not compete well with turf. This indicates that white oak is not a good in-lawn species but would be a good companion plant for pachysandra or myrtle as a ground cover.

White oak is outstanding as a specimen tree which should be grown in full sun. It can be used in parks, on golf courses, or in institutional landscapes.

Advantages of white oak include resistance to ice breakage, good tolerance to sodium chloride (highway salt), a high degree of resistance to oak wilt, good longevity and relatively low maintenance requirements. This is such a low-maintenance tree that no more than one or two corrective prunings are needed for the life of the plant.



White Oak

The main disadvantage of *Quercus alba* includes extreme susceptibility to anthracnose and a slight susceptibility to ozone and sulfur dioxide. Some white oaks are rarely affected by anthracnose. Therefore, selection and introduction of resistant cultivars would be important.

Swamp white oak

Swamp white oak *(Quercus bicolor)* is native from southern New England to the Great Lakes. It grows well in rich, acid, wet low-oxygen soils, found in flood plains. Swamp white oak has very shallow roots. Although anthracnose can be a severe problem, spraying during mid-May can dramatically reduce infection.

The summer leaf is dark green with a slightly gray-silver underside. Swamp oak is better in large-area landscapes or parks and not as street trees. In fact, swamp white oak is extremely sensitive to sodium chloride, thus should not be planted near the coast or near highways where salt is used for snow removal.

Bur oak

Bur oak *(Quercus macrocarpa)* is one of my favorite trees for growing in fine

OAK TREE GROWING HABITS

Type	Height at maturity (feet)	Canopy Shape
White Oak	50-80	oval
Swamp white oak	50-60	round
Bur oak	80-90	oval
Black oak	50-60	oval
Scarlet oak	60-75	oval
Northern red oak	60-70	round
Pin oak	60-75	pyramidal

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turf situations. It is native from western New York to the Dakotas and south to central Texas, but is found most frequently on the Great Plains. It adapts well to urban conditions, being tolerant of highway salts and ozone. It thrives in calcareous, well-drained, almost droughty soils.

Bur oak does have a tap root and is extremely drought resistant. When considering use, *Quercus macrocarpa* is most effective in large-area landscapes, such as parks, golf courses and commercial situations. Bur oak does not transplant easily; therefore, the smaller the plant, the greater are your chances for success. The foliage is dark green on the upper surface with a white tomentose on the underside. The dark blue-green of summer turns yellow to brown during late fall. The massive trunk is covered with a thick (four-inch) layer of bark, making it very fire resistant—a survival mechanism.

In its native range, a tree of the Great Plains, it carries most of the desirable characteristics of white oak. It thrives in urban conditions, requiring little maintenance.

Generally, the white oak group contains trees that are slow growing. Many are difficult to find in the nursery trade. These oaks should be used more in large-area commercial landscapes. They have few catastrophic insect or disease problems, require little or no pruning, and are tolerant of a wide range of conditions, filling niches from calcareous soils to clay loams.

Red oak

The red oak group includes black oak *(Quercus Ylina)*, scarlet oak *(Quercus occinea)*, northern red oak *(Quercus rubra)*, English oak *(Quercus robur)*, and northern pin oak *(Quercus plustris)*.

In general, this group grows more rapidly with a shorter life span. In addition, it is quite susceptible to oak wilt, as compared to the white oak group.

Black oak

Black oak *(Quercus velutina)* has a broad native range, all areas east of the Great Plains, excluding only a small portion of Texas and Florida. *Q. velutina* 's dark green leaves of summer make it a valuable specimen. It is a rapid grower in well-drained, upland sites.

In addition, it transplants with relative ease in sizes up to two inches in trunk diameter. It is intolerant; that is, a species that must grow in full sun. It can be used in large institutional grounds, parks or golf courses.

In native conditions, black oak is often found associated with scarlet oak and hybridizes readily. It exhibits many of the environmental tolerances that scarlet and northern red oak have. It should become a more valuable tree for the landscape.

Scarlet oak

Scarlet oak *(Quercus coccinea)* is a rapid growing (2 to 2½ feet per year) upland tree species. It grows well in moist, yet well-drained soils. *Q. coccinea*, while young, has a rather upright habit of growth, becoming upright at maturity. The foliage is a glossy lime-green throughout the summer which becomes an effective scarlet to burgundy. It transplants quite easily as it has a rather shallow, fibrous root system.

Among scarlet oak's advantages are that it is rapid growing and tolerant of ozone and sodium chloride. *Q. coccinea* is effective as a street tree as well as a specimen in commercial or institutional landscapes. The disadvantages include frequent pruning (every three to four years), relatively short life span (70 to 80 years) and susceptibility to oak wilt.

Northern red oak

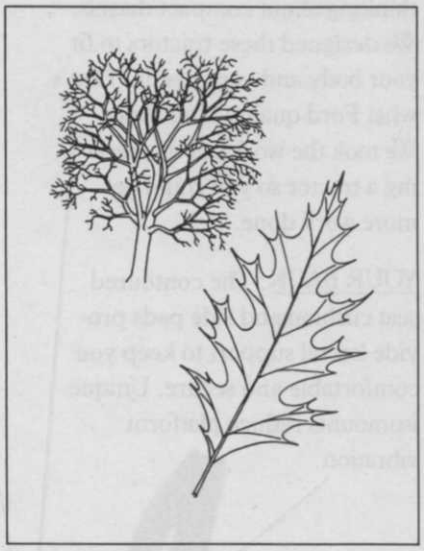
Northern red oak *(Quercus rubra)* is also a good street tree or specimen plant for park, golf course, or industrial landscapes. Its foliage is a shiny brilliant green throughout the summer, becoming a scarlet-red during the fall.

Red oak transplants readily. It grows best in moist, yet well-drained soils. *Q. rubra* is tolerant of many urban conditions, including low-oxygen soils, sodium chloride, ozone and sulfur dioxide. The main disadvantage of red oak is its susceptibility to oak wilt. When using this tree in the landscape, it should be limited to less than five percent of the street tree population to avoid catastrophic disease problems.

Pin oak

Pin oak *(Quercus sp. lustris)* displays an upright habit of growth when young. This tree has a strong central leader and horizontal branches which at maturity become heavy and can hang down. Pin oak is a relatively short-lived tree, when considering oaks, rarely living over 60 to 80 years in the landscape or 80 to 90 years in native conditions.

Pin oak thrives in acid, clay/loam soils. It is easy to transplant and grows well as a street tree if one has acid soils. Pin oak is extremely exciting as a specimen tree in golf courses and parks or commercial landscapes, but should not be used in landscapes where the soil has been disturbed. Disturbed soil usually results in iron chlorosis problems and ultimate decline of the tree.



Northern Red Oak

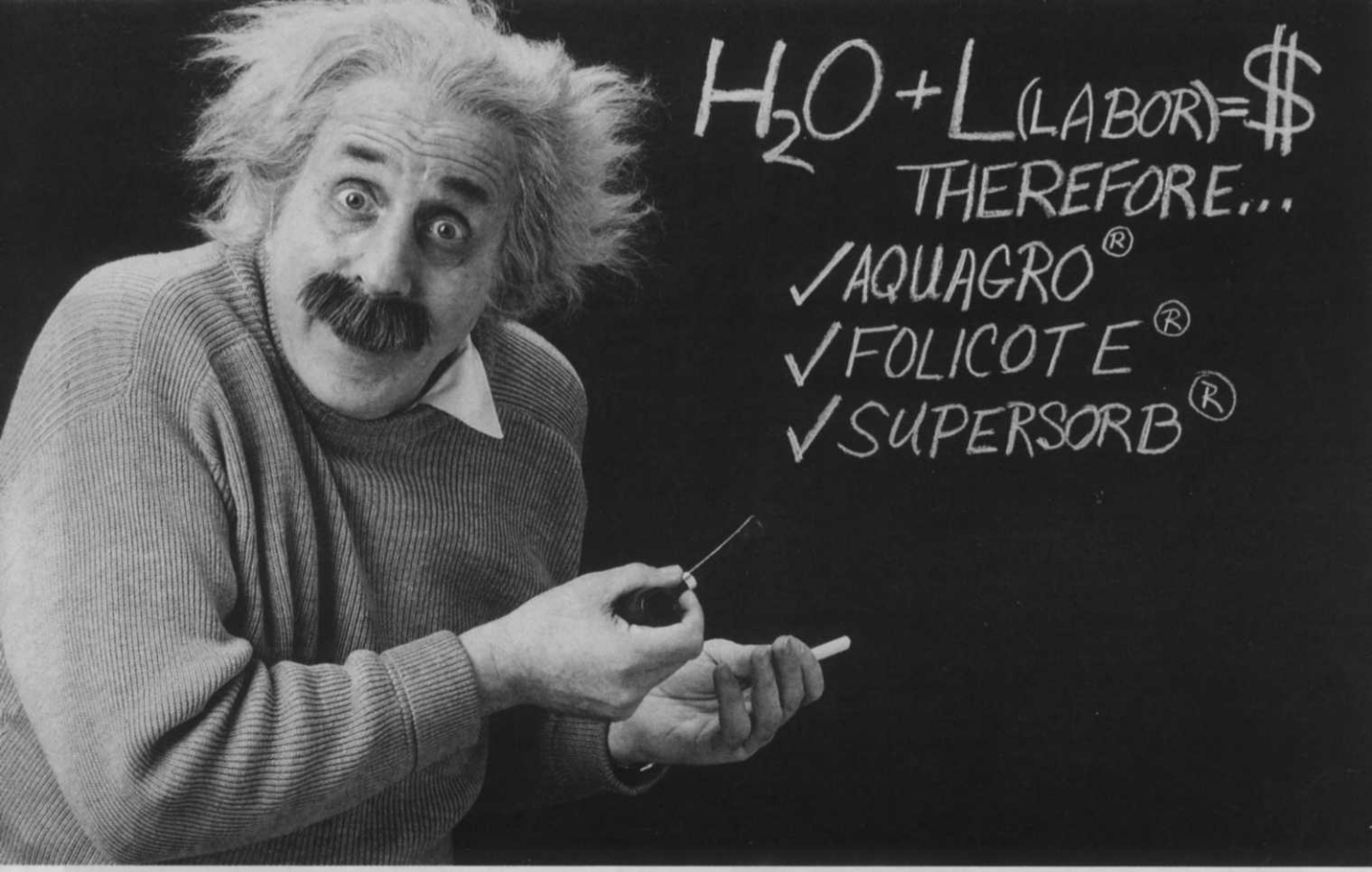
Pin oak's main disadvantages include iron chlorosis, oak wilt, and slight susceptibility to ozone and salt. (Ohio State University has reported iron citrate implants overcome the problem of iron chlorosis but, considering other maintenance requirements and disease susceptibility, this ornamental, although aesthetically exciting, should be low on the recommended list of shade trees.)

The oaks are an exciting genera which should be used more extensively in the landscape. Their native range is extensive throughout the entire eastern United States. Further, they grow in soils ranging from heavy clay to fertile, yet well-drained. Generally, many of the plants display good tolerance to urban conditions.

Most oaks are poor competitors with turf; therefore, ground covers should be used around them, such as pachysandra, myrtle or lily-of-the-valley. Bur oak *(Q. macrocarpa)* is a rare exception. It is outstanding as a tree growing in fine turf. Many of the oak species are not readily available in the trade because of reported difficulty in transplanting.

Research is appropriate to study transplanting, mycorrhiza relations, and new propagation techniques. In addition, cultivars should be selected for resistance to anthracnose or adaption to local areas, like the Great Lakes or New England states.

We must continually remind ourselves as landscape managers that provenance (local adaption) plays an important role in the survival of many oaks. Oak should highlight the landscape architect's palette of desirable adaptive native trees. **LM**



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Tine design improves aerification

by Tim Taagen

The CoreMaster 12's quadratine design improves aeration pattern efficiency and maintains a 3½-inch penetration depth with each pattern.

The principles of aggressive aerification are widely accepted throughout the turf management field. They are, in fact, becoming more important to the entire grass-growing industry.

At Cherry Hills Country Club in Englewood, Colo., we see it as among our most important agronomic programs.

In our pursuit of effective and efficient operations, we have found the CoreMaster from GreenCare International best accomplishes our goals: increased speed and effectiveness.

The CoreMaster 12 is a unique piece of equipment because the spacing of the tines (1x2; 2x2; 2x3; 2x5 inches) is easily changeable—yet when going from one to another, the approximate three-and-a-half inch aeration depth does not deviate greatly. Variables such as height of grass, soil structure and size of tines account for slight changes in penetration.

The unique thing here is that the speed is more than two times faster than other popular greens aerators, which makes this an extremely effective fairway aerifier as well. At Cherry Hills, we can do 28 fairway acres with three machines in five days, including cleanup.

Not perfect

Of course, every cloud has a silver lining.

The one problem with the CoreMaster stemmed from the fact that there was no flotation device in the original design. Only an extremely experienced operator could use it on the flattest of surfaces without the risk of tearing large areas of turf.

We turned to our mechanic for a solution. He developed a flotation device that will accommodate any undulations regardless of the severity.

The best part is that any crew member can be trained in 10 minutes to operate the aerifier safely and with no fear of turf damage.

According to Dale Hansen, turf consultant and vice president of marketing for GreenCare, the company has installed an "undulation suspension system" which became available in October. "It solves any problems of tearing the surface," Hansen says.

The company has also added a CoreCollector attachment which collects cores during aeration and dumps them automatically when the CoreMaster 12 is raised out of the turf. When the CoreMaster is lowered again, the collector resets automatically.

In a business that is becoming more mindful of sound agronomic practices, it is very important that people be aware of every available tool.

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Taagen is the assistant superintendent at Cherry Hills.

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Here's broad spectrum protection that can put a whole line-up of insects completely out of the picture: New ORTHENE Turf, Tree & Ornamental Spray.
Cleared for use on a long list of trees and plants, ORTHENE is also cleared for turf insects—including mole crickets in Florida. With ORTHENE, one spray kills pests like tent caterpillars, whiteflies, Japanese beetles and thrips on contact. Also, use ORTHENE for lasting residual action against other insects from aphids to sod webworms.
ORTHENE kills both on contact and by systemic action. It makes the whole job of protecting lawns, golf course turf, trees, shrubs and flowers simpler, more convenient and more effective. Give yourself the edge against insects. Control them with ORTHENE Turf, Tree & Ornamental Spray.
Avoid accidents. For safety, read the entire label including precautions. Use all chemicals only as directed.
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Chevron Chemical Company
ORTHENE®
TURF, TREE & ORNAMENTAL SPRAY

PROBLEM MANAGEMENT

by **Balakrishna Rao,** Ph.D.

Manganese deficiency

Problem: *You talked recently about manganese deficiency in maples. Where can I get leaves tested? My extension agent doesn't do this, at least to my knowledge. We have been applying iron sulfate, but it doesn't always work. We usually apply to the soil at the drip line. This is a major problem. (Kansas)*

Solution: You are right in your understanding that extension agents do not perform nutrient deficiency tests. However, in most states, they send the samples to state testing labs and can help that way. Check with your county agent for this possibility. We send our samples to Ohio State University or to several other private labs such as A&L Great Lakes Agricultural Laboratories Inc., 5011 Decatur Road, Fort Wayne, IN 46806-3085, telephone (219) 456-3545.

As far as your concern about iron sulfate treatment and poor results, from your questions it is not clear whether you are dealing with a chlorosis problem on maples or other plants. If you are dealing with chlorosis on maples, most likely it is due to manganese deficiency. This may be the reason why you are experiencing variable results with iron sulfate treatments. This is what we are finding in our area.

However, it may be different in your soil type and geographical location. To determine the exact micronutrient deficiency, the best thing to do is to have the soil and foliage tested for nutrient content. Based on these results, provide corrective measures.

With manganese deficiency, the treatments should be applied in early spring before bud break. Manganese doesn't green up leaves that are already chlorotic. It greens the newer leaves.

Generally, with an iron deficiency problem, timing is not very critical. Therefore, trees can be treated any time, except during moisture stress, with good results. If the trees are already showing severe chlorosis, first try to correct this problem by trunk injections. Then follow it up with soil injections to maintain the nutrient level. We have had variable results with the use of iron sulfate as a trunk injection for iron chlorosis as compared to ferrous ammonium citrate. Therefore, for iron problem, use the latter.

Managing grubs

Problem: *How can I control grubs (black aetenius and Japanese beetle) in roughs without any irrigation available? (West Virginia)*

Solution: Grub problems and their management presents a major problem to the lawn care industry. The basic problem is to get the material to the target. It is important to apply treatments during vulnerable stages of insect development. The grubs feed on roots and can cause extensive damage to turfgrass. Success in pest management depends upon proper identification, using proper materials, method and timing of control.

← Circle No. 111 on Reader Inquiry Card

As you may be aware, the currently registered grub control insecticides all have short residual and some of them will have greater affinity to bind to thatch than others. Therefore, watering after treatment can definitely improve the efficacy. With some insecticides, watering may be very critical. Some manufacturers indicate watering within 24 hours after treatment. Read and follow label specifications for further details.

For Japanese beetle grubs, late summer/early fall generally is the best time for treatment and early spring would be the next best time. When you are dealing with black turfgrass aetenius (BTA), like the Japanese grub control, timing and placement of insecticides is very important. The preventive approach would be to apply insecticides to kill the egg-laying population of adults. Overwintered adults become active in April-May, which coincides with the time when the Vanhoutte spiraea and horse chestnut will be in full bloom in Ohio. Egg laying for the second generation coincides with the blooming of Rose of Sharon. These indicator plants can be checked periodically along with monitoring for adults in spring.

With the preventive approach, it is important to post-water to move the insecticides to the first ½ inch of thatch—so that adults can be killed as they burrow down for egg laying.

Although it is difficult to manage treatment for larva it can be applied when larva first appear. For larval control in Ohio, applications are made around June. Without watering, it is difficult to manage either Japanese beetle grubs or black turfgrass aetenius (BTA).

If watering is not possible, however, the following suggestions might be useful to improve results:

- Try to apply insecticides when rain is predicted.
- Apply materials uniformly at the proper time when grubs are small and easy to manage.
- Study the life cycle and apply during the most vulnerable stage of insect development.
- Proper insecticide placement at or near the soil surface (below thatch).
- Read and follow label specifications for best results.

Balakrishna Rao is Director of Lawn Care Technical Resources for The Davey Tree Co., Kent, Ohio.

Questions should be mailed to Problem Management, LANDSCAPE MANAGEMENT, 7500 Old Oak Boulevard, Cleveland, OH 44130. Please allow 2-3 months for an answer to appear in the magazine.

Circle No. 112 on Reader Inquiry Card →

KEEP YOUR GROUNDS IN TRIM.

Whatever sort of grounds you manage professionally, ORTHO's new TAG Herbicide T/E can help you keep them clean and trim. With its fast-acting formula, TAG gives rapid burndown, usually within 24-48 hours, of a wide variety of annual grasses and broadleaf weeds. TAG has a proven track record for getting rid of unwanted grasses and weeds, even under less-than-ideal weather conditions. A non-selective contact herbicide, TAG will burn back or control nearly anything green to which it is applied.

To help TAG work at its best, use ORTHO X-77 Spreader (non-ionic). X-77 makes spray droplets spread quickly and evenly to coat waxy leaf surfaces for optimum performance.

Check the savings on TAG versus a more expensive application of ROUNDUP.® TAG does the job with a substantial savings! Get new TAG Herbicide T/E – the edge you need to keep grounds at their best, for less!

Avoid accidents. For safety, read the entire label including precautions. Use all chemicals only as directed.
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TAG
HERBICIDE T/E

PRODUCTS

Manually adjusted mower secured by three pins

The Model 6372, 72-inch mower deck from Grasshopper has an interdependent flex carrier deck. The deck and carrier work together to give contour following flex action while maintaining the desired manicured appearance.

The cutting height adjustment is secured by three tension-locked pins and is manually adjusted. A spring loaded deflector shield keeps flying debris headed groundward.

The left rear corner of the front-mount deck has been rounded to improve trimming capabilities. Belts operate on a flat plane with no twist to minimize wear and reduce downtime.

Circle No. 190 on Reader Inquiry Card

Landscape software updated with features

Abracadata, Ltd. has upgraded its landscape computer software program to include a slope option which allows the user to enter the degree of slope while the program shifts the design accordingly.

The program now has two scales, distance finding, and pull down menus to make designing easier.

The user can create property lines, add plants, trees and other landscape features. Color text and labels can also be entered.

System requirements include any Apple II computer with at least 64K memory, mouse, paddles, joystick or graphics pad.

Circle No. 191 on Reader Inquiry Card

Company adds three to extensive product line

O.M. Scott & Sons has added three new products to its Proturf line. A fine particle sulphur product is for use on greens, tees, fairways and container-grown ornamentals to correct pH problems and sulphur deficiencies.

Fluid Fungicide III is designed to increase brown patch control in areas where it is a serious problem. It also prevents and controls anthracnose on Poa, leaf spot, brown patch, dollar spot, pink snow mold and rust. It is usable with fertilizers, seed and other control products.

The third product is Turf Fertilizer with Iron, which combines iron in ferrous sulfate form and slow release encapsulated fertilizer. It is formulated for use on fairways and other large turf areas.

Circle No. 192 on Reader Inquiry Card

Twelve-foot hose keeps spray tank stationary

The Alter-Spray Portable Power Sprayer from K&G Enterprises features a 12-foot hose which allows the tank to remain stationary while spraying large areas. The spray unit can also be pulled along while operating in narrower areas.

The sprayer is excellent for liquid fertilizer and pesticide applications on lawns, shrubs, trees and gardens.

Circle No. 193 on Reader Inquiry Card

Granular herbicide gets EPA registration

The Environmental Protection Agency recently approved registration of Triamine Granular Weed Killer from Riverdale Chemical.

It is a three-way, post-emergence

DIXIE CHOPPER
The World's Fastest Lawn Mowers

42", 50" and 60" MODELS
NOW AVAILABLE WITH
FULL HYDROSTATIC DRIVE
(No Drive Chains or Sprockets)

NEW STAINLESS STEEL BODIES

8 MODELS — The Most Powerful, Productive Lawn Mowers You Can Buy!

The NEW generation of Dixie Mowers, with their full hydrostatic drives, set a new standard of excellence for the mowing industry. These are not only the fastest, most powerful mowers available, but as commercial operators will testify, they are more productive and cost effective than other mowers. With zero turning radius and 6.5 mph mowing speed, these compact Dixie Mowers offer an unbeatable combination of maneuverability for operation around trees and in tight places, and high-speed, quality cut mowing. In terms of heavy duty construction, reliability, comfort, ease of operation and maintenance, Dixie Chopper Mowers are built to meet the standards for commercial cutting operations. Before you buy — try a Dixie!

TAKE THE DIXIE CHALLENGE
Make us prove what we say. Get a Free demonstration. Write or call us today.

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Circle No. 146 on Reader Inquiry Card

Start A Lasting Relationship

Ninety-six percent of the professionals, commercial users and homeowners we talked to told us they love the way their Gravelys perform. Our two-wheel tractors are popular favorites. They produce a smooth quality cut, provide a choice of rear or side discharge and bagging. And they give years of reliable performance. The relationship starts with a test. Try a two-wheel tractor today. GRAVELY®

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Used by nurserymen and landscapers for over 40 years... A proven performer!

Wilt-Pruf® is the proven way to reduce moisture loss and drying out when plants are under stress due to transplant shock, summer or winter windburn and drought. Use whenever transplanting. Also excellent for protection during shipping and storage. Organic and biodegradable, Wilt-Pruf is the safe way to guard against moisture loss year 'round.

Order Wilt-Pruf from your distributor today.

WILT PRUF® ANTI-TRANSPIRANT

P.O. Box 4280, Greenwich, CT 06830-0280
203/531-4740

Circle No. 182 on Reader Inquiry Card

selective broadleaf herbicide composed of the amines of 2,4-D, mecoprop and dichlorprop.

The product is labeled for both cool- and warm-season grasses on golf courses, lawns, parks and ornamental turf.

Circle No. 194 on Reader Inquiry Card

Piggyback forklift carries pallets through most terrain

Spyder's new S-35X Material Handler carries its load between two hydraulically-powered front drive wheels.

This system provides lift capabilities up to 4,000 pounds though the unit only weighs 3,000 pounds. A conventional forklift carrying the same weight would have to way 12,000 pounds, according to the company.

The light weight allows it to operate on rough muddy terrain. With the S-35X's patented telescoping legs, it can maintain a level load on slopes up to 30°.

The telescoping legs also allow it to load itself onto the rear of a truck piggyback style for transportation to a work site.

Circle No. 195 on Reader Inquiry Card

Computer engineered mowers cut 21 inches

Exmark Manufacturing computer-designed its new 21-inch self-propelled and walk-behind mowers for operator convenience. Both models feature a durable, light-weight rear deck and are powered by 4 hp Briggs & Stratten engines.

They feature variable speed control and differential action for easy maneuverability on curves and hillsides.

An optional rear-bagger gives the operator extra leg room and can be attached and detached quickly.

Circle No. 196 on Reader Inquiry Card

Liquid cleaner/degreaser works on any surface

Simple Green general purpose cleaner and degreaser can be used on any washable surface, unpainted or painted, leaving no objectionable residues.

The product is used with cold water and sponged, mopped or sprayed to lift food, blood, oil and grease stains. It can also be used with salt water.

The concentrated liquid is not flammable or harmful to skin, causes no damage or irritation to the eyes and is non-abrasive.

The biodegradable product is environmentally safe and meets OSHA safety standards.

Circle No. 197 on Reader Inquiry Card

Synchromesh transmission smooths shifting on tractor

The Mitsubishi 4501 tractor features a synchromesh transmission designed to smooth gear shifting even when the tractor is in motion.

Tachometer, fuel meter and coolant thermometer are arranged on the instrument panel for easy monitoring and control.

The tractor is equipped with position, draft and mixed control standard. It has a four-cylinder, water-cooled overhead-valve engine and dry single-disc clutch.

The 4501 is available in either two- or four-wheel drive.

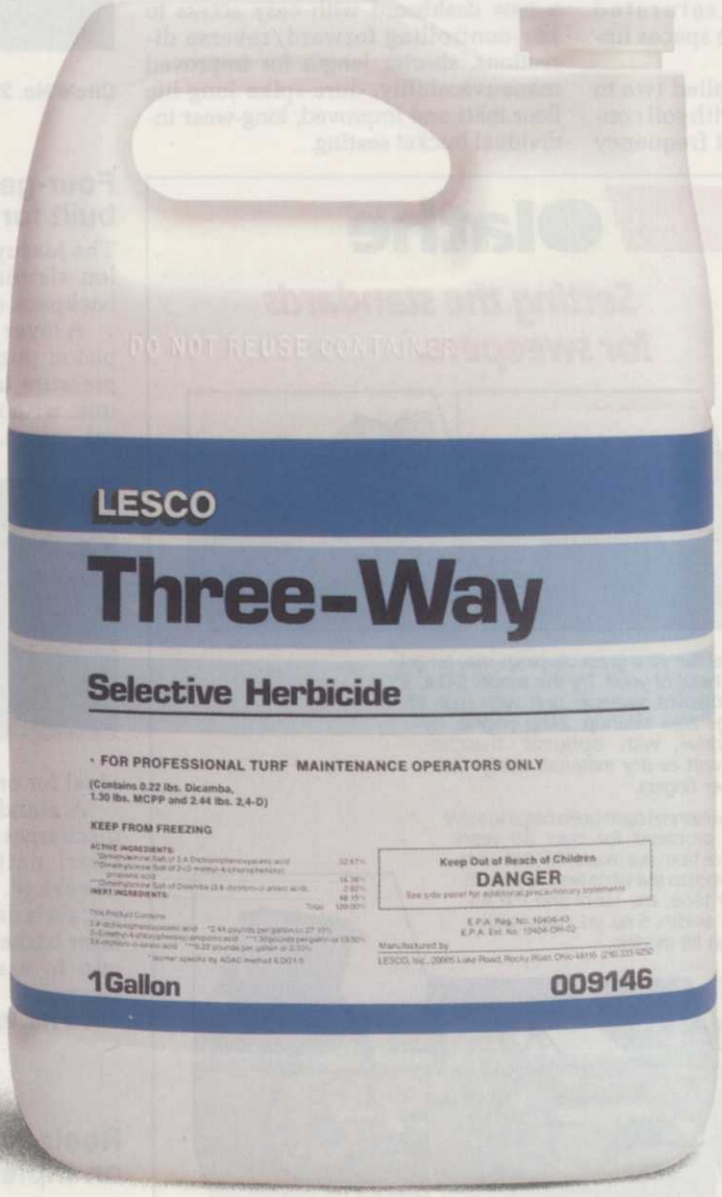
Circle No. 198 on Reader Inquiry Card

Biotech powder deposits break up soil compaction

Turftech powder from Soil Technologies is made of billions of single-cell plants per pound. The non-toxic, living product is mixed with water and sprayed on turf to help break up compaction and improve absorption.

The reproducing plant cells deposit a sugar, which binds together

A reliable old friend.



Three-Way bentgrass formulation now available.

Always read and follow instructions on package before using any chemical product.

For outstanding and economical broad-spectrum weed control, one product stands alone. LESCO Three-Way Selective Herbicide.

The combined efficiency of 2,4-D, MCPP and dicamba stops more than 30 weeds with a single application. Including tough problems like ground ivy and spurge.

And just as important is the cost effectiveness of Three-Way. Why pay more for herbicides that do less?

Outstanding weed control at an economical cost. No wonder LESCO Three-Way Selective Herbicide is still the first choice of professional turfgrass managers.

It's nice to know you can rely on an old friend. Order today.

LESCO (800) 321-5325 NATIONWIDE (800) 362-7413 IN OHIO

LESCO, Inc., 20005 Lake Road, Rocky River, Ohio 44116 • (216) 333-9250

Circle No. 143 on Reader Inquiry Card

clay particles in the soil, creating larger, more absorbent aggregates.

The larger aggregates open pore space and loosen soil, reducing compaction. Greater pore space improves water infiltration and root development.

The larger spaces also hold nutrients, reducing fading between fertilizer applications. In saturated conditions, the larger pore spaces improve drainage.

At first, Turftech is applied two to four times annually, but with soil condition improvements, that frequency drops to one or two times annually. It can be applied year-round.

Circle No. 199 on Reader Inquiry Card

'88 golf car models have improved designs

Columbia's 1988 model Par Cars include a new dashboard with easy access to key-controlling forward/reverse directions, shorter length for improved maneuverability, dura-spike long life floor mats and improved, long-wear individual bucket seating.

Circle No. 200 on Reader Inquiry Card

Four-gallon steel sprayer built for backpack use

The Maruyama MHU18D is a four gallon stainless steel sprayer built for backpack operation.

A lever arm actuates a gear-driven piston pump. A special independent pressure tank facilitates opening the unit without pressure loss or chemical splash. A strong trigger lever is

ideal for on/off spot spraying.

A standard five-head ring nozzle discharges a fine droplet/mist with a swirl pattern for effective plant coverage. An optional herbicide nozzle is designed to reduce drift. The filter basket incorporates a measuring cup to assist in chemical-to-water ratios.

Circle No. 201 on Reader Inquiry Card

Reels operate separately on triplex greensmower

Bunton's new triplex greensmower is available with either an 18 hp, twin-cylinder Onan engine or 16.5 hp three-cylinder water-cooled Kubota diesel.

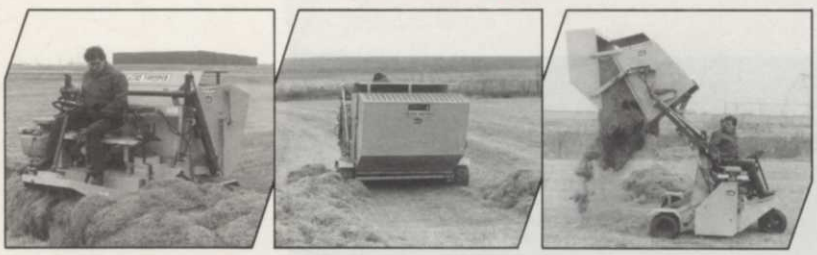
Independently operated reels allow the operator to raise individual cutting units completely from the ground to prevent turf damage by dragging during multiple mowing patterns.

All reels, carriage frames, catchers and reel motors are interchangeable, and the bedknife-to-reel adjustment is easy.

The hydrostatic closed circuit drive requires fewer valve banks and

Equipment for the turf care professional. **Olathe**

Setting the standards for sweepers.



Feel like your grass clippings may be getting ahead of you? Try this model 54HL 5' self-propelled sweeper unit with high lift for large area cleanup. 24hp engine, hydraulic-drive, with optional thatcher, sweeps wet or dry materials using 'sure-grip' rubber fingers.

Olathe personnel have been helping solve leaf/debris problems for over 30 years. Ranging in size from our model 42 (36" wide, 5hp tow-behind) to the large area tow units which are the 166e, the 166hl and the 65 PTO (all with 5' width, 5 cu. yd. capacities). Ground and high lift models.

Model 65 PTO-powered 5' width — Model 166e 5' hydraulic ground dump — Model 166hl 5' width, 81/2' lift

Model 42 tow — type, 1/3 cu. yd. 5 hp, 3' swath, finger or brush reels.

Write or call your local Olathe/Toro dealer for free demo or call 1-800-255-6438.

OLATHE MANUFACTURING, INC.
100 INDUSTRIAL PARKWAY, INDUSTRIAL AIRPORT, KANSAS 66031
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913-782-4396

Circle No. 156 on Reader Inquiry Card

We dare you to make this simple comparison.

Go ahead. Compare Scag commercial mowers to the competition. After you do, we're sure you'll agree that no competitive mower is easier to use than Scag.

Compare Cutting Speed

Scag walkers, thanks to a 4-speed gear box, cut faster than most competitive, belt-driven machines. And Scag mowers give a manicure finish cut every time.

Compare Maneuverability

Twin Power Belts!™ on the Scag walker, offer double friction to pulley surfaces so belts won't slip in normal cutting conditions, even when wet. A high rear clearance for curb climbing and balanced engine placement add to Scag's easy handling. The tight turning radius and patented pivot mount frame make the Scag rider more maneuverable than conventional belly-mount tractors.

Compare Ease of Maintenance

Scag's simple modular construction allows for easy replacement of spindle bearings and drive wheel pulleys, and on-site wheel and tire changes. Belt adjustment requires no tools. And 80% of the service parts for Scag walkers and riders are interchangeable. Easy maintenance and a smaller parts inventory add up to savings for you.

Compare Durability

Scag mowers are built to outlast and outperform the competition. Our riders and walkers are constructed from the highest quality parts and materials, like oversize cast iron pulleys, rugged pneumatic caster wheels and heavy duty spindles.

SCAG
POWER EQUIPMENT

IT SIMPLY COSTS LESS. AND CUTS MORE.

Ask your dealer about the complete line of Scag mowers from 8 to 18 hp riders and walkers with cutting widths from 32 to 61 inches.

For free literature write: Scag Power Equipment, W226 N900 Eastmound Drive, Waukesha, WI 53186 or phone (414) 544-4090.

Circle No. 166

hydraulic pumps for lower maintenance.

Circle No. 202 on Reader Inquiry Card

Compact flood lamps perform with low wattage

The 4300 Series architectural mini-flood lamps from Kim Lighting offer four low wattage lamp sources—40-watt flourescent, 60-watt incandescent, 13-watt PL lamp and 35-watt high pressure sodium.

The series' die-cast swivel assembly locks solidly into place with positive locking teeth for proper fixture aiming. Improved photometrics include an Alzak reflector system.

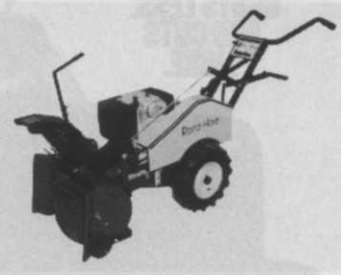
The 3/16-inch lens is clear acrylic on the 40-watt flourescent models and clear tempered glass on all other models.

All models are suited for both down- and up-lighting, with a maximum tilt of 60 degrees from vertical in either exterior or interior.

Circle No. 203 on Reader Inquiry Card

Roto-Hoe adds to snow thrower

Roto-Hoe has added two new features to its Model 969 snow thrower attachment. The new 180-degree swivel spout and heavy duty skids give the machine improved performance and



durability.

Model 969 is one of 20 attachments for Roto-Hoe's Models 910 and 990 rear tine tillers.

Circle No. 204 on Reader Inquiry Card

Tractors adapted to landscape management

The Deutz-Allis 6200 series of tractors, formerly marketed primarily to

commercial grain and livestock farmers, can be adapted to a wide range of landscape management uses.

The air-cooled diesel engines were built for years of hard work, the company says. All controls are right where they should be, easy to reach and use. Visibility is clear and unobstructed in any direction.

Circle No. 205 on Reader Inquiry Card

Before you fertilize . . .

GET THE THATCH OUT!

knife reel

flail reel

According to turf experts, **excessive thatch** must be **removed** after a hard winter in order to have healthy turf in the spring. Thatch prevents **nutrients** from reaching down into the root structure. Result: the lawn cannot breathe and grow properly.

BlueBird has the **most complete line** of power rakes in the industry, a rake for every lawn and purpose. Spacings for every application. Interchangeable flail reels and knife reels are available for vertical mowing, and together they answer **every need** of lawn service professionals in every part of the country. Call your distributor **today** for a BlueBird catalog. For the name of your distributor call the BlueBird Action Center. BlueBird International Inc., 2778 South Tejon, Englewood, Colorado 80110. Phone (303) 781-4458.

BLUEBIRD INTERNATIONAL®

Circle No. 105 on Reader Inquiry Card

bobcat TRENCHERS

RUGGED, POWERFUL, VERSATILE AND SIMPLE TO OPERATE.

From compact, walk-behind models to powerful riders, Bobcat trenchers are loaded with advanced design features to make trenching easier for do-it-yourselfers and professionals.

The T108. Precision power for do-it-yourselfers. The T108 packs plenty of power on a compact frame that maneuvers easily through gates, around shrubbery and close to walls or sidewalks. All controls are within easy reach at the operator station.

With a 36" digging depth, it's ideal for running electrical and water lines as well as cable TV and telephone lines.

The T116. The ultimate walk-behind trencher. Do-it-yourself trenching is made easy with the fully hydrostatic, walk-behind Bobcat T116 trencher. It makes short work of digging up to a 48" deep trench — even in tough soil.

Advanced hydrostatic power drives the wheels and digging chain, and automatically matches machine speed to ground conditions. A limited-slip, two-speed axle is used on the T116 for constant two-wheel drive. And all controls are within easy reach at a position behind the unit.

Bobcat trenchers are easy to transport from jobsite to jobsite.

Choose from four model sizes, with trenching depths ranging from 24" to 60" to fit your trenching job.

The T135 and T136. Rugged, powerful, reliable — the best trenchers in their class. The diesel-powered T136 and gasoline T135 combine the best of two worlds—the performance of advanced hydrostatics plus plenty of horsepower. And both models' 60" digging depth handles a wide range of trenching jobs. Utilities. Construction. Plumbing. Electrical. And more.

A two-lever, hydrostatic system propels and steers both models, and provides independent ground and chain control to match unit speed to changing ground conditions. Hydrostatic power also means fewer parts.

You'll trench straighter and faster with Bobcat features such as automotive-type steering. Easy to reach controls. Solid, stable frame. And 360 degree visibility.

The T906 Backhoe. Add versatility to your rider trencher.
Your Bobcat rider trencher* becomes a tough backhoe with the T906 backhoe attachment. Its rack and pinion swing and tip-up operator seat provide outstanding power and operator visibility. The T906 digs up to six feet deep. And it comes with four bucket sizes to fit your needs.

The Bobcat Commitment
TOTAL CUSTOMER SATISFACTION

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Fargo, North Dakota 58108-6019
bobcat

Circle No. 147 on Reader Inquiry Card

How to Use Embark® PGR to Reduce Mowing Costs for Ornamental Turf:

This proven PGR program for irrigated, low-traffic ornamental turf saves you 3 mowings or more per treatment . . . while at the same time thickening up the grass and improving its appearance. Read about our special $100.00 demonstration incentive offer.

Everett Mealman, *President*
PBI/Gordon Corporation

For several years, universities, landscape management professionals and PBI/Gordon have been experimenting with PGRs in an effort to adapt their usage to ornamental turf. The problems that have concerned all of us are discoloration and the long-range effect that a PGR might have on the health of turf grass.

Today, we can confidently report that PBI/Gordon has a proven program for using Embark PGR on irrigated, low-traffic ornamental turf. It is based on 2 years of testing by Washington State University researchers. Furthermore, this program has been fine-tuned and successfully used on hundreds of acres of commercially managed ornamental turf.

It reduces the maintenance cost by eliminating 3 and sometimes 4 mowings of cool-season grasses that would otherwise be required and, in the process, measurably enhances the vibrant green color and long-range health of the turf.

It is a major breakthrough in landscape management and we are announcing a special, one-time $100.00 demonstration incentive offer to help you test the program.

Four reasons why our Embark program works

In the first place, the rate for Embark is reduced from 1½ pints per acre to 1 pint. The objective is not to totally shut off the growth so that no mowing is necessary. Rather the objective is to *slow it down* to such an extent that the number of mowings can be reduced by 50% or more for a period of up to 6 weeks.

The second factor is the use of Ferromec® AC Liquid Iron Complex in the program. Ferromec is PBI/Gordon's patented iron/urea molecule bond that is foliar absorbed and circulates within the plant so rapidly that green-up occurs within 24 to 48 hours. It is an ideal tank-mix companion because Embark does not begin its work until 48 hours after application. Thus, when Ferromec is combined with Embark, it has the green color firmly fixed before Embark kicks into gear.

In the third place, Embark and Ferromec AC can be tank mixed with either Classic Trimec® or Super Trimec Turf Herbicide, thus giving the PGR/Iron treatment a free ride, since you are going to spray Trimec anyway.

And, finally, there is the fact that Embark is a true Plant Growth Regulator, in contrast to some so-called PGRs that are actually herbicides to be applied at low rates which all too often

Paul Constant, left, president of Constant Care Inc., and Everett Mealman examine the tillering and root development of a plug of grass from a shopping center lawn treated with the Embark/Ferromec program in the spring and autumn of 1987. This photograph, taken on October 7, clearly shows the lush, thick, vibrant green turf produced by the Embark/Ferromec program!

may stunt the growth and weaken the plants.

Embark, on the other hand, is a PGR in the strict meaning of the word. It is absorbed through the blades and translocates to the growing point (at the base of the blade), where it acts to suppress seedhead development and stem elongation. The energy which would normally be used to produce rapid growth of leaves, stems, and seedheads for you to mow, is diverted to root and rhizome development.

Timetables and program for using Embark PGR on ornamental turf

A tank mix of Embark, Ferromec AC, and Trimec is applied in the spring, ideally timed to catch the seedheads. This would be a window of about 4 to 6 weeks between the time when the grass begins to green up and when you can feel the seedhead in the boot.

This treatment will result in lush, vibrant green, weed-free turf that is growing so slowly that at least half of the regular mowings can be eliminated for up to 6 weeks.

The Embark will wear off at about the same time that hotter weather starts causing untreated grass to lose some of its color and condition. But because the Embark treated grass has been on *slow-hold* and conserving the energy that would otherwise have been dissipated on *fast-forward*, it will start living it up and reach a zenith of beauty when the untreated grass has run out of gas.

Along about August 15, or when cool-season grasses start to grow vigorously again, repeat the treatment. The need for mowing for the next 6 weeks will also be reduced by 50% and more.

The experience of a leading landscaper with Embark PGR

One of the most successful users of the Embark program for ornamental turf is Constant Care Inc., who is one of the leading landscape management contractors in the Kansas City area. It's evident why they would be an early adapter to Embark, when you know their business creed. Paul Constant, president of the corporation, states it this way:

"We've been experimenting with PGRs for 4 or 5 years," says Bill Gordon, director of commercial landscaping maintenance for Constant Care Inc., "and we've found that Ferromec AC is *the* vital element in making the Embark PGR program feasible for ornamental turf. Other irons simply don't work fast enough."

"Our mission is to provide a total, turn-key job: landscape design, installation and maintenance, including turf, ornamentals, and even irrigation. We seek and serve progressive clients who recognize that exterior decoration is every bit as important as interior decoration.

"We will provide these clients with an overall landscaping look that projects a clear image of top quality; and we will accomplish this objective within the framework of a budget that is competitive, and at the same time sufficiently profitable so that we can grow and prosper and adequately compensate our dedicated people who make it happen."

No wonder Constant Care is on the leading edge of progress, rather than mired in a status quo mind-set that bases landscape management charges on an a la carte menu rather than the *mission accomplished* bottom line that the client really wants!

No wonder Constant Care Inc. is one of the 30 fastest growing companies in the Kansas City area!

$100.00 demonstration incentive offer:

Admittedly, using Embark PGR on ornamental turf is a challenging thought, and thus it is that we want to suggest that you test the program on 8 acres of turf so you can see for yourself the unprecedented impact that Embark is destined to have in the management of ornamental turf.

To test the program on 8 acres of irrigated, low-traffic turf, you will need 1 gallon of Embark, 22 gallons of Ferromec, 2 gallons of Super Trimec or 4 gallons of Classic Trimec. When you have completed testing a minimum of 4 acres, you are entitled to your check for $100.00.

Call us toll-free to let us know that you want to participate in the test. We will tell you how to manage the program, and will refer you to a distributor in your area who will supply you with product and any information you need.

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PLANT GROWTH REGULATOR

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Circle No. 187 on Reader Inquiry Card

Green industry coalition

To the editors:

In your "Outlook" in December, 1987, LANDSCAPE MANAGEMENT, you commented on the need for a green industry coalition to address potentially adverse issues.

You should know that there is such a coalition that exists in different forms with different players, depending on issues. NAA, PLCAA, The American Association of Nurserymen, The Associated Landscape Contractors of America, The Golf Course Superintendents and the Professional Grounds Management Society, frequently work together on issues of common interest. We each know when it is time to rally support and when there are issues we need to work separately on. Perhaps we don't blow our own horns enough on this subject, and there's no question about the fact that we could do more of it.

I think it's a great idea for you to mention it and keep pushing the concept. By doing so, we can only gain support for our individual and collective efforts.

Robert Felix
National Arborists Association
Amherst, N.H.

Lighting up landscapes

To the editors:

Just wanted to tell you and your staff that I liked the article "Tips for lighting up Christmas landscapes" in the December 1987 issue. I have never seen an article on the subject and thought it was a clever idea, offering good tips and information.

Have a good year and keep up the good work!

Dorothy Borland
The Turf Expert
Denver, Colo.

Non-toxic herbicide?

To the editors:

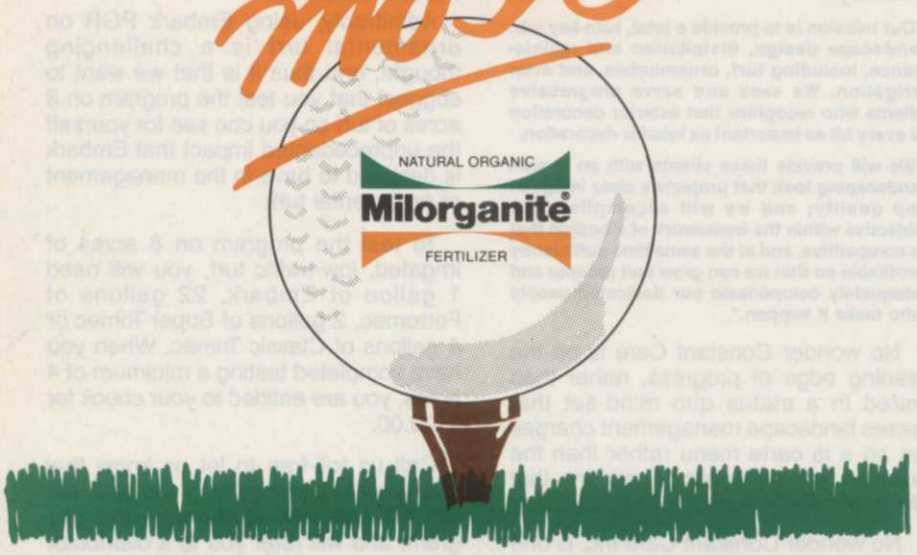
"Non-toxic herbicide is also biodegradeable" (Dec. 1987, pg. 55). I am sure this title drew attention from many of your readers on first glance. Before you go out and stock up on your biodegradeable vegetation control, you may wish to consider two points:

1) There is no such thing as non-toxic and it is against most Canadian and U.S. regulations to advertise any product as being such. Products are only "relatively non-toxic" as it is impossible to provide experimental evidence that anything is safe; only non-safety can be experimentally demonstrated.

2) The word biodegradeable is also a nice advertising slogan describing one of the eight major factors which influence pesticide fate and behavior after contact with the soil, namely microbial degradation. When I think of biodegradeable, the first products which come to mind are a relatively common family of chemicals referred to as "phenoxies." For example, MCPA is rapidly degraded by soil microbes to the simple compounds of CO_2, H_20 and C_{12} and has an average half-life in soil of 14 days. Seedbeds and grass can be replanted as soon after an application of MCPA as with the triglyceride (fatty acid) products being promoted by Safer.

Kent E.M. Groves
ChemlawnRexdale,
Ontario, Canada

FOR MOST



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To see more great ideas, get started at your Ransomes distributor. Or call Ransomes, Inc., One Bob Cat Lane, Johnson Creek, WI 53038, (414) 699-2000.

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The mark of excellence in professional lawn care.

Our 32" commercial power mower, like all Exmark intermediate mowers, is available with variable speed or 5-speed transmission.

Circle No. 126 on Reader Inquiry Card

EVENTS

APRIL

7-8—Landscape Estimating Workshop. San Jose, CA. Contact: Charles Vander Kooi, P.O. Box 621414, Littleton, CO 80162; (303) 697-6467.

10-13—Menninger Sunbelt Tree Conference. Cypress Gardens, FL. Contact: Jack Siebenthaler, P.O. Box 6524, Clearwater, FL 34618; (813) 446-3356.

11-12—Playground Safety and Design Workshop. The National Institute on Parks and Grounds Management, Milwaukee, WI. Contact: National Institute, P.O. Box 1936, Appleton, WI 54911; (414) 733-2301.

12-15—Missouri Parks & Recreation Association Annual Spring Conference. Clarion Hotel, St. Louis, MO. Contact: David Ostlund, 1203 Missouri Blvd., Jefferson City, MO 65101; (314) 636-3828.

14-15—National Agricultural Chemicals Association Spring Conference. Stouffer Concourse Hotel, Arlington, VA. Contact: Elizabeth Barton, 1155 15th St. N.W., Suite 900, Washington, D.C. 20005; (202) 296-1585.

17-20—New York State Recreation and Parks Society 48th Annual Conference and Exhibition, Monticello, NY. Contact: Arthur Ambuhl, NYSRPS, 119 Washington Ave. Albany, NY 12210; (518) 463-1232.

19-21—29th Annual Turfgrass & Landscape Institute. Anaheim Convention Center, Anaheim, CA. Contact: Ed McNeill, 2492 E. Mountain St., Pasadena, CA 91104-3423; (818) 798-1715.

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Easy to use. All B-U colorants are concentrated, easy to mix, wash off quickly and are available for applications on turf, weeds, brush, small trees, etc. Write or call for brochures.

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Exhibit in Landscape Expo and you'll reach commercial and residential lawn care specialists; university and park grounds superintendents; golf course managers; sports field managers; landscape contractors and many more. You'll meet decision-makers from around the country who are interested in buying new power equipment; chemicals; seed; fertilizers; irrigation systems; vehicles; accessories and services. Dollar for dollar, you won't find a better advertising value!

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Attendees can get away from their businesses and bring the family for a relaxing getaway. Discount coupons from local shops, restaurants and attractions will add to the fun.

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Prizes, giveaways and in-hall entertainment will create an upbeat, exciting atmosphere during all three days of the show.

Plan to be there — reserve space today!
Your customers will be at the Landscape Exposition in Nashville — you should be there too! For a complete exhibitor prospectus and floorplan call Becky Lerew, Show Manager or Mary Sue Christoffers, Sales Manager at (203) 853-0400 or write to Landscape Expo, 50 Washington Street, Norwalk CT 06854.

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Circle No. 139 on Reader Inquiry Card

CLASSIFIEDS

RATES: $1.10 per word (minimum charge, $25). Bold face words or words in all capital letters charged at $1.35 per word. Boxed or display ads: $90 per column inch-1x (one inch minimum); $85-3x; $80-6x; $75-9x; $70-12x. Agency commissions will be given only when camera-ready art is provided by agency. For ads using blind box number, add $10 to total cost of ad. Send ad copy with payment to Dawn Nilsen, LANDSCAPE MANAGEMENT, 1 East First Street, Duluth, MN 55802 or call 218-723-9200.

BOX NUMBER REPLIES: Mail box number replies to: LANDSCAPE MANAGEMENT, Classified Ad Department, 1 East First St., Duluth, MN 55802. Please include box number in address.

BUSINESS OPPORTUNITIES

PALM BEACH & WEST PALM BEACH FLORIDA - Landscape Maintenance Company full service. Est. 1980. Be your own boss. Will train some financing. Call Today (305)627-8141. 5/88

LAWN RENOVATION! Total Lawn Renovation saves the customer money and gives them what they want everytime—a beautiful new lawn. These satisfied customers provide a built in client base for establishing your year round lawn fertilizing program. I've developed a complete business package which will provide you with the sales tools and information you need to successfully enter the low startup/high profit lawn renovation market and build your own fertilizing business. The cost $199.95. For more information give me a call, Greg (206) 527-5368. 3/88

WANT TO BUY OR SELL a golf course? Exclusively golf course transactions and appraisals. Ask for our catalog. McKay Golf and Country Club Properties, 15485 N. East Street, Lansing, Michigan 48906. Phone (517) 484-7726. TF

HELP WANTED

LANDSCAPE EMPLOYMENT OPPORTUNITIES - One of the Midwest's largest commercial landscape contracting and maintenance firms seeks motivated, quality individuals to fill the following positions: Landscape Maintenance Supervisors, Estimators/Contract Administrator, Landscape Materials Buyer, Foremen, Pesticide Applicators. Excellent salary and benefit package. Send resume to: Reinhold Landscape, 23216 Telegraph, Flat Rock, MI 48134. 4/88

We are looking for a Landscape Foreman with experience in leading and working with installation crews. Duties include job estimating reading blueprints, staking jobs, and pruning. We are located in the heart of the Blue Grass State of Kentucky. Family owned business since 1841. Benefits include paid vacation after 1 year, health insurance plus profit sharing. Your salary is negotiable depending on experience. Contact Stephen Hillenmeyer, C/O Hillenmeyer Nursery, 2370 Sandersville Road, Lexington, KY 40511. 3/88

LANDSCAPE MAINTENANCE SUPERVISORS AND FOREMEN - Heyser Landscaping, Inc., a prominent landscape contractor in the Philadelphia, Wilmington, Allentown area is seeking experienced personnel in all phases of landscape maintenance, pest management and installation. Contact Heyser Landscaping, Inc., 400 North Park Avenue, Norristown, Pennsylvania 19403, 215-539-6090. 5/88

PRIME OPPORTUNITY OPERATIONS MANAGER - Our rapidly expanding landscape construction/maintenance firm seeks aggressive well organized individual for operations manager. Candidate should have 2 years supervising experience in horticulture, be very good working with people and be very knowledgeable of ornamental plants and turfgrasses. Pesticide experience helpful but not required. Good salary and benefits. Send resume and salary requirements to Pro Scapes Inc., 1223 Old Stonehouse Road, Syracuse, NY 13078, or call 315-446-5353. 3/88

San Francisco Bay Area landscape firm seeks individual with strong horticultural, construction, irrigation, and client relation skills for landscape installation foreman position. Learning and growth opportunities with established company. Competitive compensation and benefits. Letter and/or resume to Landscape Care Company, 4026 Pacheco Boulevard, Martinez, CA 94552. 3/88

$1,000,000.00 SALES PERSON - Our top producing landscape salesperson sold $1.6 million during 1987. We're looking for a challenger, a motivated and overachieving landscape salesperson with a proven track record. If you are looking for top wages, an opportunity to excel, and your background includes sales of quality landscapes and developing client loyalty, call today and accept the challenge. Our 16 year young, award-winning Design/Build firm serves residential and commercial clients in the booming Cleveland, Ohio market area. Call 216-357-8400. 5/88

MANAGEMENT: Ever-Green Lawns Corporation, a division of the multi-national Hawley Group, Ltd. is looking for experienced lawn and tree care professionals. Please respond in writing only to Richard D. Niemann, Corporate Recruiter, Ever-Green Lawns Corp., 1390 Charlestown Industrial Drive, St. Charles, MO 63303. TF

LANDSCAPE FOREMAN - Year round with a quality company located on the coast of MAINE. Experience managing construction and planting crews. Generous benefit package for qualified candidate. Send resume with work experience and salary history to: **EARTHWORKS/MATTESON, LANDSCAPE AND TREE EXPERTS,** P.O. Box 31, Yarmouth, ME 04096. 3/88

ASSISTANT MANAGER/FOREMEN - Expanding maintenance/design firm servicing corporate accounts and estates, requires quality-conscious assistant manager for maintenance division and experienced foremen for maintenance and construction divisions. Associate horticulture degree plus 2 years experience desirable. Excellent compensation package, advancement and career opportunities for goal-oriented individuals. Submit letter of application, resume and salary history (in confidence) to: Eastern Land Management, 433 West Main Street, Stamford, CT 06902. 4/88

LANDSCAPE MAINTENANCE SUPERVISOR - Rapidly expanding landscape management firm seeking experienced quality individuals with ability to manage people. Tremendous opportunity with full benefits. Forward your resume with salary history to Tandem Landscape Company, 33W480 Fabyan Parkway, Suite 101, West Chicago, IL 60185. Attention: Glenn Kedzie. 3/88

TREE CARE SALESPERSON - B.S. degree preferred in Urban Forestry, Horticulture or related field. We offer Medical Plan, Profit Sharing, Savings Plan and Paid Vacation. Send resume with pay history to Ira Wickes - Arborists, 11 McNamara Road, Spring Valley, NY 10977, 914-354-3400, attention John. 5/88

Lucrative, challenging opportunity for motivated individual to direct irrigation division of leading landscape/irrigation company. Thorough knowledge of design & trouble shooting a must. Send resume to **TERRAFIRMA INC.,** Attn: David Bender, 3780 E. Morgan Road, Ypsilanti, MI 48197. 313-434-3811. 3/88

Tree and Shrub Care Technician: Experience a must. Must be state licensed. Should be able to help develop accounts. Excellent growth potential for Michigan's largest landscape contractor. Send resume or call: Vidosh Bros., Inc., 36199 Mound Rd., Sterling Heights, Michigan 48310, 313-264-9492. 3/88

Landscape Foremen: Experience in all phases of landscape installation on commercial and residential sites. Able to supervise a landscape construction crew and work from a set of landscape plans. Excellent growth potential with Michigan's largest landscape contractor. Send resume or call: Vidosh Bros., Inc., 36199 Mound Rd., Sterling Heights, MI 48310, 313-264-9492. 3/88

Lawn Maintenance Foremen: Experience in all phases of maintenance for commercial and residential sites. Able to organize a maintenance crew. Experience with maintenance equipment, operation, and repair. Must have good driving record. Send resume or call: Vidosh Bros., Inc., 36199 Mound Rd., Sterling Heights, Michigan 48310, 313-264-9492. 3/88

LANDSCAPE DESIGN & SALES: Leading Kansas City landscape company has immediate opening for talented, experienced and aggressive person in residential and light commercial design and sales. A.S. or B.S. in horticulture or related field preferred. Salary incentive, benefits. Send resume with experience and salary history to: Hermes Company, P.O. Box 14336, Lenexa, KS 66215. 913-888-2413. 3/88

LAWN CARE PROFESSIONAL: Commercial landscape firm looking for responsible person to start up lawn care division. Responsibilities to include applications, service calls, record keeping, training and inventory. Prefer B.S. in Agronomy or at least 2 years field experience. Generous wage & benefits package. Send resume to Hunt & Hulteen, Inc., 50 Spark Street, Brockton, MA 02402. (1-617-580-1062). 3/88

MANAGEMENT TRAINEE: Tampa area commercial landscape management firm has opening for person with horticulture degree. Must have knowledge of Florida plants and have the ability to communicate. Initial responsibilities include horticultural quality control and customer service. No experience required. Positive professional attitude and willingness to learn a must. Call Mr. Blanchard 813-854-2383. 3/88

Seeking manager with excellent administrative, sales and marketing skills for position in well established sod farm/sprinkler system company north of Denver. Horticultural background preferred, "people skills" a must. To develop innovative sales programs, coordinate schedules, evaluate and hire employees, conduct maintenance overviews and public relations. Letter and/or resume to: Doke Enterprises, Inc., 1425 Weld County Road 32, Longmont; CO 80501, Attn: Personnel. 3/88

LANDSCAPE/MAINTENANCE POSITIONS: Hard-working supervisors, foremen and crew members needed by Northern Virginia firm engaged in all phases of landscaping, maintenance and hydroseeding. Call or write Turf Specialists, Inc., 10109 Giles Run Road, Lorton, VA 22079, (703) 550-9196. 3/88

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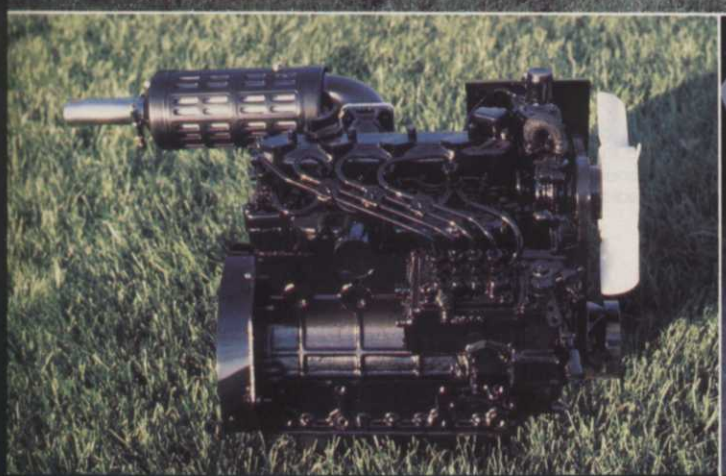

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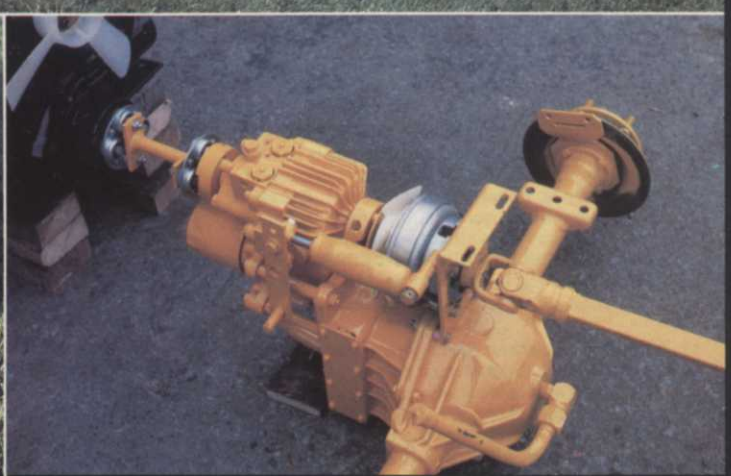

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SELECT the KUBOTA engine to fit your needs.

Choose the 4-cylinder 22HP diesel, the 3-cylinder, 16.5 HP diesel or the 3-cylinder, 21 HP gas. ALL engines are water-cooled.

A new direct drive system to the cutting deck eliminates PTO belts. This direct drive system assures maximum power transfer to the deck. NO belts means NO belt wear and no slippage.

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Circle No. 220 on Reader Inquiry Card

HELP WANTED

TREE WARDEN/ARBORIST - The City of Boston Department of Parks and Recreation is seeking a tree warden/arborist to assume a leadership role in a new commitment to improve the City's tree population. This effort is part of a much larger commitment to the restoration and improvement of the City's green spaces. Responsibilities: Administrative and staff/contract development and organization and supervision of all tree planting, trimming, removal, and I.P.M. of street and park trees. Qualifications: Bachelor's Degree in Arboriculture or related field. At least 5 years management experience in urban parks and street tree maintenance with a strong background in the technical aspects of tree maintenance. Must possess strong organizational and supervisory skills. Strong communication and public outreach skills are essential. Massachusetts Pesticide Applicator Certificate in Ornamentals, Turf and Right of Way and Valid Driver's License are required. Salary Range: 37,500 - $40,000. City of Boston residency is required. Please send resumes to: Don King, Parks and Recreation Dept., Room 816, Boston City Hall, City Hall Plaza, Boston, MA 02201. The City of Boston is an Equal Opportunity Employer. M/F/H. 3/88

GROUNDS MAINTENANCE SUPERVISOR - John Brown University, a small, Christian college in northwest Arkansas. Responsibilities: General supervision and maintenance of grounds and game fields. Plan, install, and maintain flower beds, turf, and new plantings. Qualification: Grounds maintenance and supervision, experience desirable. Individuals with background in landscape management, horticulture, turf management, etc. are encouraged to apply. To apply send resume to Lea Facundus, John Brown University, Siloam Springs, AR 72761. John Brown University is an equal opportunity employer. 3/88

LANDSCAPE MAINTENANCE FOREMEN: Quality oriented landscape firm is seeking quality oriented foremen for positions in: landscape installation, maintenance, construction, and sales. Excellent salary, bonuses, benefits, and rapid advancement. Relocation assistance available. Send resume to: **FOUR SEASONS LANDSCAPING, INC.**, 112 B Frederick Ave., Rockville, MD 20850. 3/88

SALES: Landscape Sales person with 1-2 years experience. Individual must be aggressive, motivated and able to work with crew foreman as well as prospective clients. Design ability a must. Contact: Vander Veen Landscape Co., P.O. Box 164, Mason, MI 48854 (517) 676-1093. TF

EXPERIENCED LANDSCAPE FOREMAN: Design & Construction Company seeking person with 3-5 years experience. Individual must be able to take total responsibility of projects, from start to finish. Plant knowledge, construction techniques, blue print reading a must. Contact: Vander Veen Landscape Co., P.O. Box 164, Mason, MI 48854 (517) 676-1093. TF

Landscape design/build company needs reliable foreman with 3+ years of experience in all or most phases of landscape construction including retaining walls, brick patios, planting, seeding, and tractor operation. If you can produce high quality landscapes, this is your opportunity to work for a well-established and progressive company offering good pay, full benefits, and potential for career advancement. Positions also open in irrigation, maintenance, and landscaping divisions. Send resume or call, Mill Creek Landscapes, 2118 Walker Ave., Greensboro, NC 27403 919-274-6007. 3/88

AGRONOMIST - Lawn Doctor, the nations leader in franchise lawn care, is seeking an individual to join our national staff. Position involves working with franchises on turf program development, training, safety, and regulation. BS Agronomy with warm and cool season turf experience and strong communication skills required. Must be willing to travel and relocate. Resume and salary history to Lawn Doctor, P.O. Box 512, Matawan, NJ 07747. 4/88

CREW SUPERINTENDENTS: Houston, TX. We are looking for experienced, aggressive people to grow with us. Send resume and salary history to: **THE GROUND CREW, INC., P.O. BOX 219041, HOUSTON, TX 77218.** Or just call me collect. Stuart Scandridge, 713-578-9519. 4/88

LESCO, INC.

A leader and complete supplier of equipment and products to the Turf Care Industry, is seeking aggressive, mature, customer oriented individuals to join the team as:

SERVICE CENTER MANAGER

This position will have P/L responsibility for the management of a warehouse operation serving the professional lawn care industry; including local sales development, inventory control and accounts receivable. Ideal candidates should have previous experience in the lawn care and/or golf course industries, or possess a horticultural background. Past selling experience helpful.

Positions are available in Long Island, Baltimore, Philadelpia, Washington, Rochester, N.Y., Cincinnati, Pittsburgh, Detroit, Cleveland, Columbus, Akron, Dayton, also in various Florida metropolitan markets.

Our firm has an established growth pattern and record of profit sharing. Interested and qualified candidates should submit resume and salary history in confidence to:

Brad Gerson
LESCO, INC.
20005 Lake Road
Rocky River, OH 44116
Equal Opportunity Employer

HELP WANTED: Landscape, turf and spray foremen, nurserymen and pruners. Experience and/or education necessary to work for our dynamic, quality oriented, large, 40 year established company in the Hamptons on Long Island. Professional wages and benefits, year round, full time positions. Contact: Whitmore-Worsley Inc., P.O. Box 10, Amagansett, NY 11930. (516) 267-3756. 3/88

GROUNDS MANAGER - Well established, quality conscious, real estate development and management firm requires full time Grounds Operation Manager for all seasons management of large corporate office parks located primarily in the lower Connecticut/Westchester/Putnam, New York area. **Applicant** must have minimum five years experience in care and management of trees, shrubs, turf and pavement. Knowledge of and ability to administrate contracts. A working knowledge of site work and irrigation systems. Individual must have good communication skills and ability to deal with labor as well as executive staff. **Growth position.** Salary open. Send resume and salary requirements to: Grounds Management, Box 269, 324 Main Street, Norwalk, Connecticut 06851. 5/88

OLD WESTBURY GARDENS is seeking applications for experienced gardeners in the areas of 1) general landscape maintenance; 2) cutting garden planning, planting and maintenance; and 3) herbaceous perennial maintenance. Salary commensurate with experience. Contact Robert Bowden, Director, Horticulture and Operations, Box 430, Old Westbury, NY 11568. Call (516) 333-0048. Available immediately. 4/88

Help Wanted - Grounds management supervisor - **AWARD WINNING CORPORATION** is seeking grounds management supervisor. Must be "intelligent" and self-motivated with a minimum of 2 years "hands-on" supervisory experience. Must be able to schedule, train and motivate crews of 9-12 in all phases of grounds care. Horticultural degree and pesticide license beneficial. Send resume with salary requirements to A & R Landscaping, 500 Tidewater Drive, Norfolk, VA 23504. 3/88

LANDSCAPE SALESMAN/ESTIMATOR NEEDED: Aggressive Landscape Company has immediate opening for career-minded, aggressive irrigation & landscape estimators and/or salesman. Permanent position with a future. Salary and benefits commensurate with experience. Equal opportunity employer. Send resume to Mickey Strauss, American Landscape,Inc., 7949 Deering Avenue, Canoga Park, CA (818)999-2041. 3/88

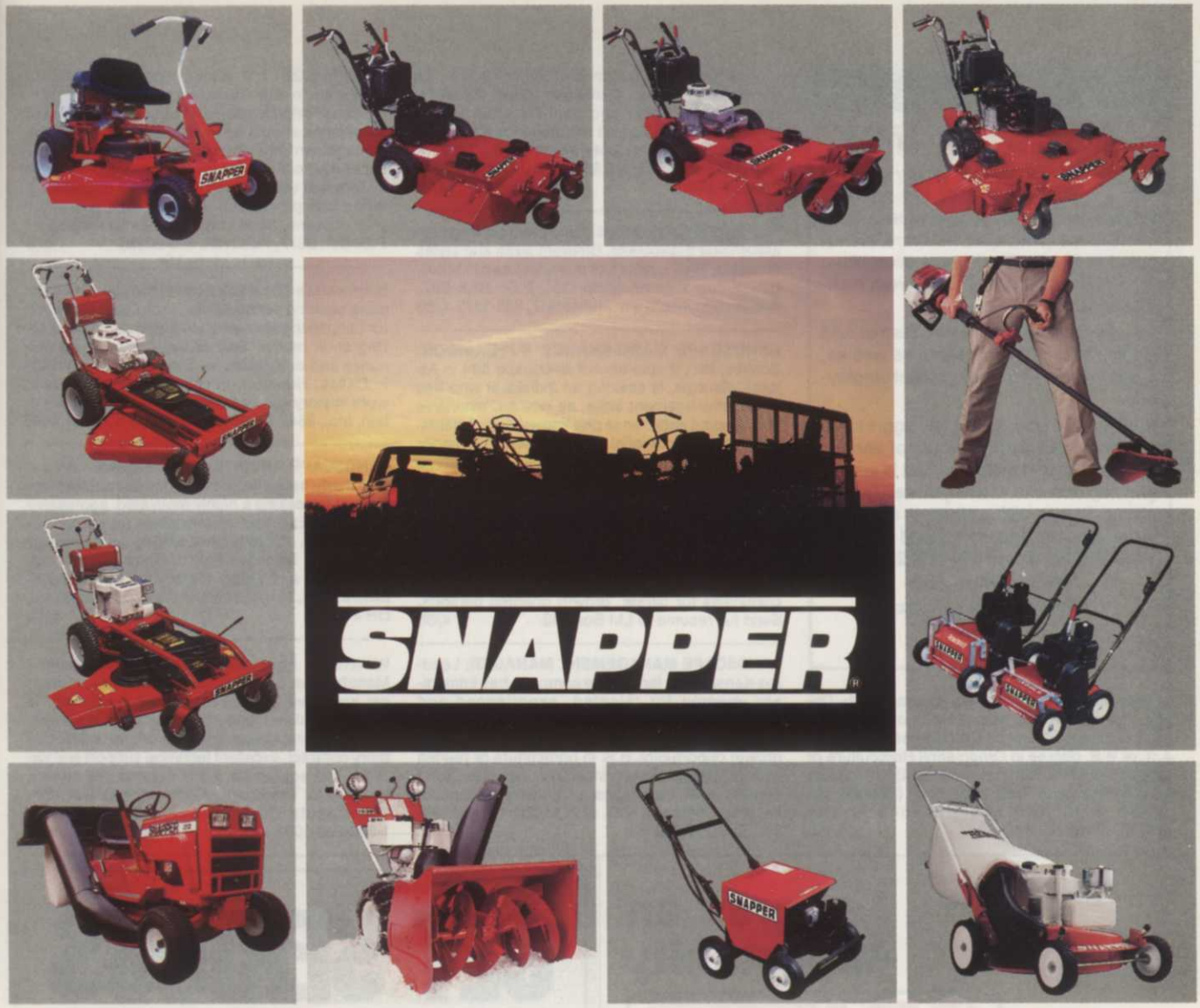
TRAINEES & FOREMEN: Washington D.C. area design-build firm is looking for career minded individuals who want to learn top of the line residential landscaping-construction, planting & landscape maintenance. We need professionals who are willing to work and can produce. We work a 4-5 day week and offer good pay with benefits. Send resume with references to: Garden Gate Landscaping, 821 Norwood Road, Silver Springs, MD 20904. Attn: Jim Seipel. 3/88

PERSONNEL: Hydro Lawn, a Mid-Atlantic full service lawn care company is accepting applications for Sales/Customer Service management positions. Applicants must be aggressive, responsible, neat and experienced in sales/customer service. Compensation from $25-35,000 plus full benefit package. Send resume to: Hydro Lawn, Inc., 7905 Airpark Road, Gaithersburg, Maryland 20879. TF

LANDSCAPE CONSTRUCTION FOREMAN. Experienced persons needed to lead our construction crews. A thorough knowledge in sodding, planting, R/R tie work, and walk/patio construction are required. Come grow with this progressive landscape corporation. Send resume and salary history to: D.J. Murphy Landscape Co., Inc., P.O. Box 3079, Framingham, MA 01701. 3/88

Established Central Florida landscape contractor has an opening for a highly qualified operations manager for its maintenance division. Ability to schedule, organize and manage people in a rapidly growing organization. Heavy field experience and a commitment to quality work required. Opportunity for an aggressive person to be a key member of a top-notch team. Excellent salary and benefits. Call Mr. Singh (305) 831-8101. 5/88

Florida Landscape Contractor in business 15 years, has an opening for an experienced landscape architect or highly qualified sales person to handle design build sales and business development. Applicant must be a self-starter and possess strong sales skills. Unlimited potential in a growing firm with a top notch track record. Contact Mr. Singh (305) 831-8101. 5/88



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For over 35 years Snapper has been building the highest quality outdoor power equipment money can buy. Lawn care professionals know that such quality means lasting dependability and steady profits. And now Snapper makes this quality available in a wider selection of commercial products for your business.

All heavy-duty walk mowers come with the power and options to make big jobs a snap. Pick from 32," 36," or 48" models. A 60" model will be available soon. Our mid-duty walk mowers come with 30" or 41" decks featuring pivoting front ends to reduce scalping. 21" Hi-Vac® walks feature 3 bushel grass catchers, and have 5 hp engines with heavy-duty parts for longer life.

Snapper is America's number one choice in rear engine riders. Our Extra Tough models feature 12 hp engines and 5 forward speeds with on-the-go shifting. Our lawn tractors give you a choice of 33," 41" and 48" mowing decks.

There's more to this business than mowing and Snapper has you covered with power pluggers, power rakes, trimmers, edgers and even a 2-stage commercial snowthrower.

So, for day in day out profitability, invest in Snapper quality. Write Snapper Power Equipment, Dept. 000000, McDonough, GA 30253.

SNAPPER POWER EQUIPMENT, McDonough, Georgia 30253. A division of Fuqua Industries

Circle No. 170 on Reader Inquiry Card

HELP WANTED

CAREER OPPORTUNITIES

ORKIN LAWN CARE (a division of Rollins, Inc.), is one of the nation's largest and fastest growing Lawn Care Companies. With over 43 branches located in 12 states our expansion plans for FY88 will require more proven management.

We are looking for Branch, District and Region Management talent, as well as, Sales and Service Management employees.

If you are ready to join an aggressive company with over 87 years of service business experience, one that is stable, growing and one where you can build a strong career with unlimited advancement opportunities then send your resume TODAY or call 404-888-2771.

Personnel Director
Orkin Lawn Care Division
P.O. Box 647
Atlanta, GA 30301

Landscape assistant at major Country Club. Design, installation, and maintenance of Clubhouse and landscaped areas on Golf Course. Must have A.S. or B.S. degree in Ornamental Horticulture or related field. $20,000 plus benefits. Send resume to: 665 Hightower Trail, Dunwoody (Atlanta), GA 30350. Attn: Golf Maintenance or call 404-993-2040. 3/88

Landscape Salesperson position available with Yardmaster, Inc. in Cleveland, Ohio. Excellent compensation plan and benefits. Join Ohio's largest design/build and maintenance firm. Send resume or call **YARDMASTER, INC., 1447 N. Ridge RD., PAINESVILLE, OH 44077, 216-357-8400.** 4/88

Gazebo Dealers Wanted. Huge profits selling preassembled gazebo kits. Different sizes and styles available. High quality kits manufactured in Michigan. Shutt Construction Co., P.O. Box 397, Williamston, Michigan. Phone (517) 655-1915. 4/88

LANDSCAPE MAINTENANCE SUPERVISOR: Scapes, Inc., a commercial landscape firm in Atlanta, Georgia, is seeking an individual who has strong management skills, as well as, extensive landscaping experience and knowledge of plants. Advancement potential — up to Division Manager — makes this position ideal for a goal oriented individual. 404-956-7500. TF

PRODUCTION/SALES/MANAGEMENT — Aggressive Texas full-service landscape firm now accepting resumes for entry level positions in sales, production and management. Excellent opportunities for career, growth oriented persons. Send full resume to LM Box 443. 4/88

LANDSCAPE MANAGEMENT MANAGER: Leading Kansas City landscape company has immediate opening for talented, experienced and aggressive person to manage and develop our maintenance and chemcial division. Excellent growth opportunity. B.S. in horticulture or related field preferred. Salary incentive, benefits. Send resume with experience and salary history to: Hermes Company, P.O. Box 14336, Lenexa, KS 66215. 913-888-2413. 3/88

WINNERS ONLY: If you love the lawn care business, and are still looking for your personal security and comfort levels, send us your resume. Your experience should be in all phases of lawn care, management, customer sales and service. We are expanding our operations and will offer the right individual a unique once in a lifetime opportunity. When you prove your abilities, we'll guarantee your success. Send your confidential resume to: P.O. Box 5677, Rockville, MD 20855. 3/88

Southwest's finest landscape management company seeking enthusiastic, motivated individual for Landscape Maintenance Supervisors position. Degree in related field or experience in maintenance and or installation. Opportunities available in Dallas, Houston, Fort Worth. Send resume/work history to: Personnel Administrator, Maintain, Inc., 2549 Southwell, Dallas, TX 75229. 3/88

LANDSCAPE ARCHITECT/SALESMAN - An established, reputable, growing Cleveland landscaping firm is seeking a highly motivated, aggressive individual. Excellent opportunities for career advancement. Professional wages and benefits year-round. Incentive bonus. Send resume with experience and salary history in confidence to Emerallawn, 35144 Lakeland Boulevard, Eastlake, OH 44094. 4/88

WANTED - Aggressive Manufacturer's Reps - Manufacturer of agricultural, golf course, municipal and lawn & garden spraying equipment is seeking qualified reps with experience in sprayer sales. Seeking nationwide network, exclusive territory contract, excellent technical support and top of the line equipment. Send resume and current line card to: The Broyhill Company P.O. Box 475-CB, Dakota City, NE 68731-0475. Phone: 1-800-228-1003. 3/88

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not an ordinary out front riding lawn mower. **Grazer** has the features you want enhanced by rugged smart styling.

Simply Operated with quick responding steering levers and comfortable secure ride plus complete view of the full floating deck.

Counter Rotating drive wheels powered by dual hydrostatic transmissions provide a true zero turning radius.

Tilt Back Deck eases cleanout, servicing blades and spindles.

Grazer is available in models from 12.5 to 18 hp with a wide range of deck widths and attachments.

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Like all our equipment, the Victor 800 is built Bowie tough for long, trouble-free service. Its 800 gallon tank can easily spread 350 pounds of mulch over 8,000 square feet in one application. The Bowie Victor 800 is equipped with a built-in shredder bar, and uses twin agitators to keep slurry homogeneous. Call or write Bowie today. We make serious equipment for serious landscapers.

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COURSE SPECIFICATIONS:

1. TEES AND GREENS:

SR 1020 Creeping bentgrass

Excellent putting quality

- Produces dark green, fine textured, uniform turf
- Has good Pythium resistance

2. FAIRWAYS:

SR 1020 Creeping bentgrass or Champion Ryegrass Blend

Endophyte enhanced

- Composed of two outstanding ryegrasses: SR 4000 and SR 4100
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- Contains high levels of endophyte for improved stress performance and resistance to common turf insects
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3. ROUGHS:

A mixture of Champion Ryegrass Blend and Merit Kentucky bluegrass

Insect resistance

- Holds up against excessive wear
- Looks great at both low and higher cutting heights

4. SLOPES AND BUNKER EDGES:

SR 3000 Hard fescue

Low maintenance

- Persists under low maintenance
- Produces an attractive, dark green, low growing, fine textured turf
- Contains high levels of endophyte
- Has excellent shade tolerance

SR varieties are available nationwide. For more information call:

1-800-253-5766

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Circle No. 168 on Reader Inquiry Card

Commercial Landscape Contractor in Chicago suburbs seeks an individual for its estimating staff. Applicant must have excellent mathematical aptitude, ability to read and interpret landscape plans, and compatibility with computer and horticultural knowledge. Please send resume with cover letter to Otto Damgaard Sons, P.O. Box 182, Des Plaines, IL 60016. Attention Valarie Shepard. 3/88

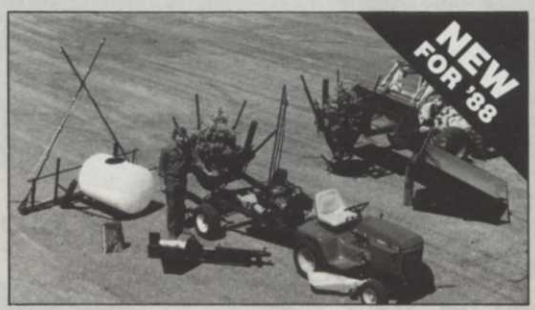
GROUND MAINTENANCE AND PLANTING SUPERVISOR/FOREMAN: Well established landscape contractor in the Philadelphia area is seeking experienced quality supervisors and/or foremen to fill various positions. Salary and benefits commensurate with experience. Forward resume to: Personnel Office, Heyser Landscaping, Inc., 400 N. Park Ave., Norristown, PA 19403. 4/88

SALES MANAGER - A very aggressive person currently active as sales manager is needed to develop sales for an established and progressive (design/build landscape firm located in the Chicago western suburbs) firm. This person will work closely with a principal of the firm and eventually take over the top management position of vice president in charge of sales. Good salary. Compensation package tied to performance. Equity/ownership possible for the right person. We are interested in only experienced highly motivated professional individuals. Send resume to LM Box 447. TF

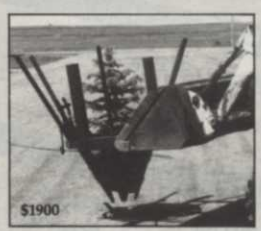
Landscape Designer / Salesperson - A good deal for the right person. Send resume or call J. Gilmore Design Landscaper, P.O. Box 400, Cortland, OH 44410 (216) 638-2075. 3/88

The Ultimate, All-In-One Landscape Implement!

The unique, new Dakota Hand is designed to be a do-anything, go-anywhere landscape tool.



TOWABLE TRANSPLANTER



BUCKET or 3-POINT MOUNT TRANSPLANTER

SPRAYER

The main parts are a towable, bucket or 3-point mount tree transplanter, a boom sprayer, a log splitter, a dump box, post hole digger, and a spreader. The transplanter's patented floating cradle enables you to hydraulically vary the root-ball diameter up to 28 inches.

Options include water pumps, hydraulic pumps, jack hammers, hydraulic power packs, and much more.

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Also Available POST HOLE DIGGER and SPREADER

LOG SPLITTER

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TURF DIVISION MANAGER

Leading specialty chemical manufacturer, well established in the turf market, with headquarters in Chicago Area, seeks a manager for its turf products division.

Candidates should possess a strong sales & marketing background with experience in the turf industry.

This person will be responsible for the growth & development of the entire division including P&L. Concentration will be placed on maintenance, development & continued growth of an established distributor network & product line.

This is an exciting opportunity for a highly motivated individual. Ability to travel is necessary.

For complete details, including compensation & benefits package send resume or letter including salary history to:

LM BOX 448

Working managers experienced in all phases of lawn servicing looking for opportunity to grow. We offer lots of work, advancement opportunities to the right people, good to excellent compensation and security. Must be willing to relocate to the East coast (Washington D.C. area) or if you're the right person we will consider you for a new office from Virginia Beach to Northern New Jersey. Call or write to: Ron Miller, Super Lawns, P.O. Box 34278 Bethesda, MD 20817, 301-365-4740. 3/88

TREE CLIMBERS/BUCKET OPERATORS/STUMP GRINDER OPERATORS Large landscape company needs reliable employees. Excellent wages and benefits for career-minded individuals with two years experience supervising and motivating people. Send resume to Rood Landscape Co., P.O. Drawer 1568, Jupiter, FL 33468-1568 or Phone (305) 746-5186. 3/88

FOR SALE

Two 1983 JACOBSEN HF-5 mowers. Used 1809 hours/2070 hours. Make offer. Call Marc Fenton, (801) 649-2093. 3/88

FOR SALE: Toro Parkmaster, micro adj., 7 gang, 5 blade, rebuilt cutting units, rebuilt engine, absolutely top cond., 100% ready for spring. $10,900. Also, 1968 International rough terrain forklift, side-shift, $6,900. Also, 7 Jacobsen fairway mowers, no frames (rough) $700. (313) 653-5695. MI. 4/88

COLORADO LANDSCAPE MANAGEMENT BUSINESS-for under $100,000. Small, profitable, well managed, commercial contracts, quality equipment. Can include close-in acreage, house, shop. P.O. Box 8070, Fort Collins, CO 80526. 3/88

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Out Performs - The Carryall I is available in Gasoline or Electric power - the Gasoline 4 cycle/341cc Engine* is the largest in the industry. The Electric powered Carryall I has components especially manufactured for Club Car, and they provide 25% greater efficiency than the competitors.

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* Club Car Exclusive Features.

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FOR SALE

"TREE SPRAYER" 30 GPM Bean - 600 gal. steel tank - electric hose reel - skid mounted on 1975 Chev 1-ton- will separate. $6,000.00 or best offer - John 317-293-5300 - 317-844-1799. 4/88

FOR SALE: 18" BRUTE sod cutter. 3 Pt. hitch, PTO driven. Has cut less than 10 Acres, (513) 667-1346. 4/88

(1) FMC Sprayer—like new condition, factory unit 600 gallon tank, 35 GPM, industrial engine, hose reel, hose, etc. Used only 5 months—$6,995. **(2) 1973 Ford F350,** 10' flatbed, 4 speed, new paint, V-8, low mileage, factory built 500 gallon stainless steel tank, 25 GPM Friend pump, 4 cylinder Wisconsin engine, hose reel, hose. Excellent condition—drive away today! $3,595. **(3) 1969 Chevy C50,** 14' flatbed, 4 speed, V-8, 67K original miles. Excellent condition! 25 GPM Friend sprayer, 500 gallon tank, 4 cylinder Wisconsin engine, hose reel, hose, etc. Must be seen—drive away today! $4,595. 516-582-1563 (9:00 A.M.-9:00 P.M.). Photos available upon request. 3/88

Bucket Trucks, Tree Spade, Chippers, Stump Grinders, all makes and sizes. Check with us for the best deal going! Equipment in your area. We're Brokers. American Equipment Sales 314-789-3576. 24 Hours. TF

LANDSCAPING WITH WILDFLOWER? Get the facts and the best price. All mix components and species selected for your area and unique conditions. Turn high maintenance areas into low maintenance beauty for under 1¢ per square foot (seed costs). APP, RD5, Box 265, Mt. Pleasant, PA 15666. (412) 423-8170. 3/88

REEL GRINDER USED EXPRESS DUAL: Reel Grinder and Angle Master bed knife grinder. Both in excellent condition. Asking $9,500 for the pair. Call Mowing Machine Grinders and Reels, Inc. 205-222-2591. 4/88

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Spot treatment cuts labor, materials. Automatic — Adjustable — Accurate.

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Two used Brouwer Harvesters, Fords, 18" rolling units—both reconditioned and ready to go. $19,000 and $18,000. Model 3500 Hitchhiker, $14,000, Model 3600 Hitchhiker, new and demos. Like new Spyder diesel, $15,000. Huber Ranch Sod Nursery, 219-552-0552. 3/88

Leaving country, need to sell. 1979 Brouwer Sod Harvester in excellent condition. 72" cut x 18" wide, brush attachment, rubber mat, roof lights, roof cover. Mounted on 3600 Ford Diesel with oil cooler. 1,293 hours. Contact Kenneth Mach, Rt. 3 Box 109, Yukon, Okla. 73099. 405-354-3989. 3/88

52 inch walk behind Bunton Lawn Mower, electric start, like new. Int. 2500 Series B Diesel Tractor. Call 414-723-2916. 3/88

REINCO HYDROGRASSERS and power mulchers in stock. Opdyke Inc. (Philadelphia Area) 215-721-4444. TF

BEAN SPRAYER DO50E, 600 gallon stainless steel tank, refiller attachment, Hannay reel, 3/4" hose & gun. Used 2 seasons. $9,500. 207-985-2567. 3/88

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TREE SPRAYER: 1000 Gal. Steel Tank, Wisconsin V-4, 50GPM pump. Hannay electric reel, 3/4" hose on a 1972 GMC V8, 2 speed axle. 419-865-5453. 4/88

Princeton Sod Harvester - 24 in. cut, slab, self propelled, Hi Flotation, One of a kind. $12,000.00 517-676-2362. 3/88

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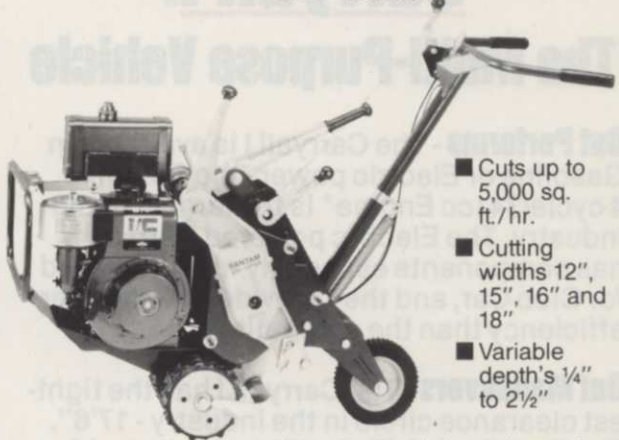
Circle No. 181 on Reader Inquiry Card

TURFCO **BANTAM**
Sod-Cutter



- Cuts up to 5,000 sq. ft./hr.
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- Variable depth's ¼" to 2½"

As well as cutting new sod the Bantam is ideal for cutting dead, worn or weed infested turf and preparing the ground for installation of new sod. The design incorporates full complement of adjustment for blade depth and angle to meet the demands of different applications. The Bantam now features a 8HP Industrial/Commercial (I/C) engine.

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TURFCO

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The CL Series is for Commercial/Lawn Users. Superior performances in both rough cut and refined mowing, at speeds to 11 miles per hour. Hydrostatic propulsion, 20 HP engine, low center of gravity, rear discharge "clamshell" deck, vertically articulating rider and big 23" steered wheel combine for added safety, operator comfort and control. The "CL" gives the commercial user a tough, low maintenance machine that mows better at top speed in either refined or rough conditions than other mowers at half the speed.

Kut-Kwick. More than forty years of experience building commercial mowers for professional users.

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Irrigation GUIDE

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FOR SALE: 1984 to 1986 Chevrolet C-60's with V8, 5-speed, 2-speed or auto transmission. Most have four wheel disc brakes, tinted glass, AM radio, undercoated and rustproofed, with 1000 to 1200 gal. stainless or fiberglass tanks. 100 gal. saddle tank, dual reels, Hydro cell or Bean 2020 pump, PTO, material storage racks, Lesco spreader mounts, ready to service your customers, from $16,800 to $21,900. Call Scott, (314) 928-3727. 3/88

FOR SALE: Brouwer Roll-Up Sod Harvester, model A3A 18" on Ford 3000 Diesel tractor. 513-667-1346. 3/88

For Sale: Lawn-A-Mat (7) Economy Tractors (14-16 HP), (7) combines and various spare parts. 513-242-7300 evenings 513-385-5336. 3/88

CUSTOM LANDSCAPING TRAILERS. Protect your investment from exposure and theft. Choice of colors, delivery available. **NORTHWEST TRAILERS,** Palatine, IL 800-522-6208 or 312-577-6208. 7/88

REINCO Power Mulchers and Hydro Grassers. Poniatowski Bros. Equipment Company, 30 Route 31, Flemington, NJ 08822. 201-782-3514. 6/88

THE AFFORDABLE STUMP CUTTER: Stainless Steel, HEAT TREATED, 5½ lbs., FAST, SAFE cutting. Unique locking system holds 6 grooved carbide teeth removed with one recessed bolt. Compatible with new or old two wheel Gravely Tractors. Kinetic Stump Cutter Inc., 1220 W. Hawie St., Jupiter, FL 33458 or (305)744-0680 after 5 p.m. EST. 3/88

Hustler 275, Bobcat T186 lawn mowers for sale, also Scaggs 48" Rider along with assorted walk behind mower. All in good condition, 516-267-7789. 3/88

BOWIE HYDRO-MULCHERS AND STRAW BLOWERS, New and used. Landscape Supply, Ltd., P.O. Box 22092, Greensboro, NC 27420. (919) 292-2922. 3/88

Model 1010 stainless 150 gallon **JOHN BEAN SPRAYER,** 7 HP, turf tires, 757/785 guns. Also, **DIDIER CHIPPER.** All excellent condition. 712/623-9372, Red Oak, IA. 4/88

HANNAY REELS: New in the box, E1526s and E1530s, $339.00. Lawn spray hose 275 psi and 600 psi, all sizes. Original Imler measuring wheels, $48.00. Glycerin filled gauges 0-60 psi, 2-02100 psi, $19.95. Polypropylene ball valves ½" to 2" Chemlawn guns $75.95. Lawn spray boots $16.95. Lawn spray gloves $1.25/pr. Call **Hercsh's Chemical Inc.,** 1-800-843-LAWN outside of Michigan or 1-313-543-2200. TF

Massey Ferguson tractor 1984 model #270: 65 H.P. tractor in excellent shape. Only has 1100 hrs. and that was only for grass cutting. Call (703) 698-7474, Fairfax, VA. 4/88

BOB-CAT NEW 1988 48" KAWASAKI ENGINE - $2650. A-1 LAWNMOWER, WAPPINGERS FALLS, NEW YORK. CALL 914-221-LAWN. 3/88

PIPE LOCATOR—Inexpensive! Locates, traces PVC, metal, cement pipes, sewers, septic tanks, electric, phone, gas lines. Block & Company, Box 18058, Cleveland, OH 44118. 216-371-0979. TF

TREE SPRAYING ROUTE: Western Suffolk, Long Island. 1982 Bean 600 Gal. SS. Tank - 50 G.P.M. Pump - Electric reel. 1972 GMC 5500 - 250 Accounts - All contracted. Nets - $25,000 for 4 months. Call (516) 499-8050. 4/88

SPRAYERS: New Skid-mounted 300 Gallon Fiberglass Tanks. Electric Reel with 300' hose and gun. Unused - List $3,470.00. Will take Best Offers. (216) 656-4200. 3/88

Ryan Sod Cutter with cut-off. Excellent condition. $2,000. 501-729-5847. TF

TREE SPRAYER - 1984 FMC 500 gallon sprayer with new fiberglass tank. Mechanical agitation, 20 gallon/minute pump, 600 psi. Mounted on 1975 Ford F600, Imron paint, excellent condition. Asking $7,000.00 as unit. Will sell separately. Call (616)896-9588. 3/88

ROCK RAKES—Harley TR3-8 3 Pt. Hitch, PTO Drive, Good Condition. **ROCK PICKER** —Anderson E Series, PTO Drive with Hi-Lift, Excellent Condition. Write or call: Bob Ruff, Stoney Creek Golf Course, Wintergreen, Virginia 22958. (804) 325-2200 Extension 530. 3/88

Finn Hydroseeders, Mulch Spreaders, Krimpers, Pit Burners, Fiber Mulch & Tackifiers. New & Used. Wolbert & Master, Inc., P.O. Box 292, White Marsh, MD 21162, 301-335-9300. TF

USED EQUIPMENT FOR SALE—Hydroseeder - 1500 gal. Bowie mounted on Tandem Diesel Truck, $14,500. Backhoe attachment for Bobcat, 700 Series, $2,900. Call 216-357-8400 or write EQUIPMENT, 1447 N. Ridge Rd., Painesville, OH 44077 for photos. 4/88

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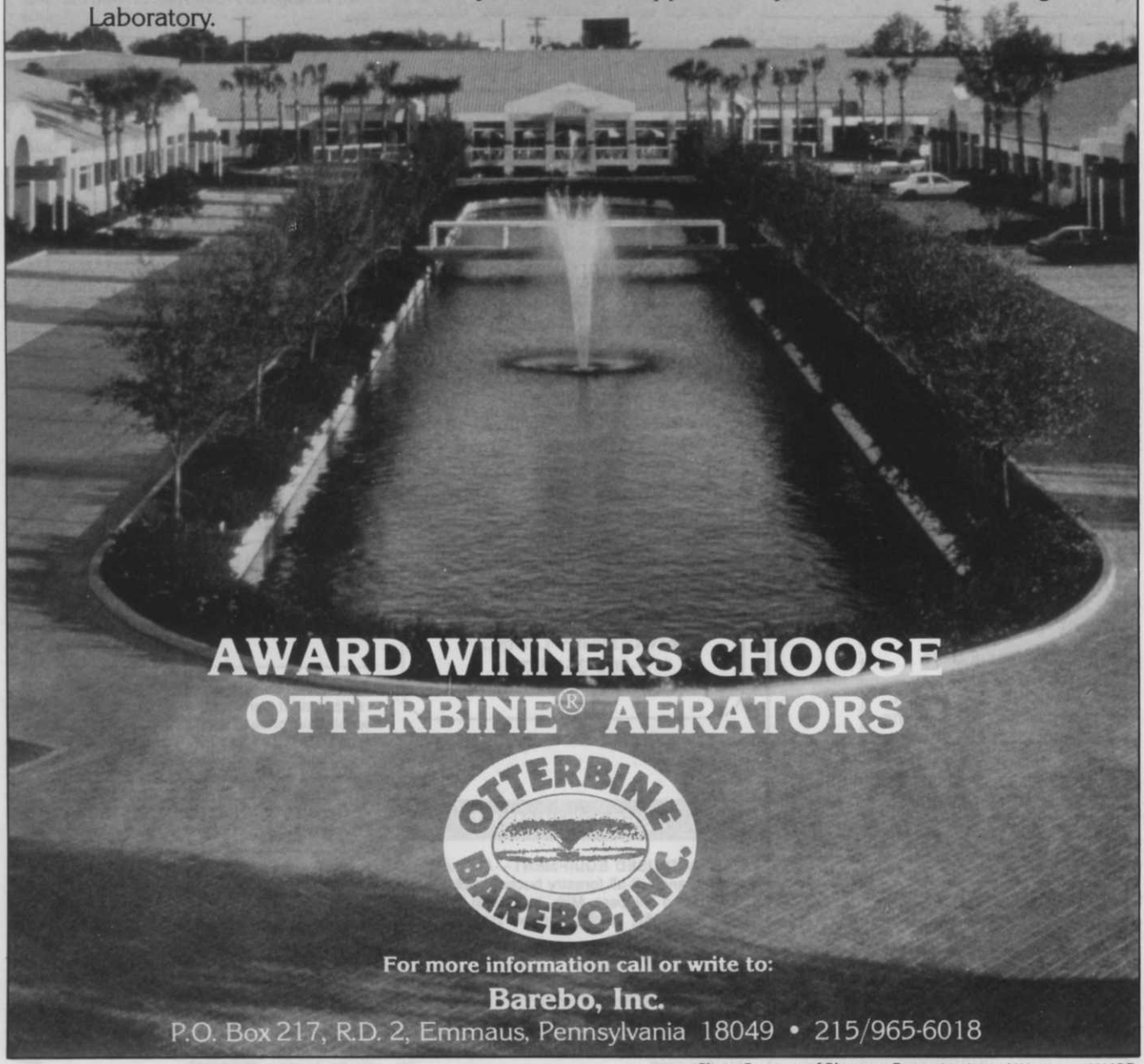

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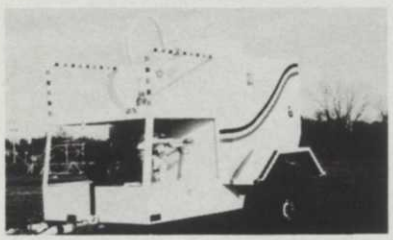

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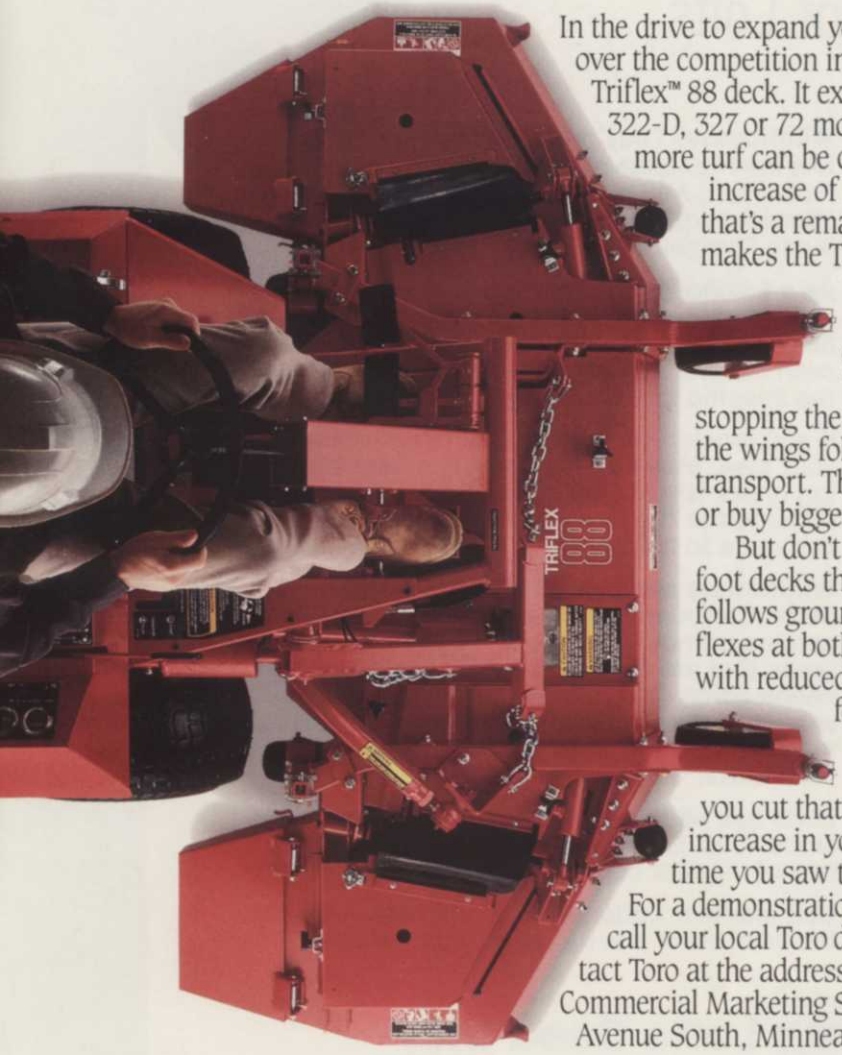

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